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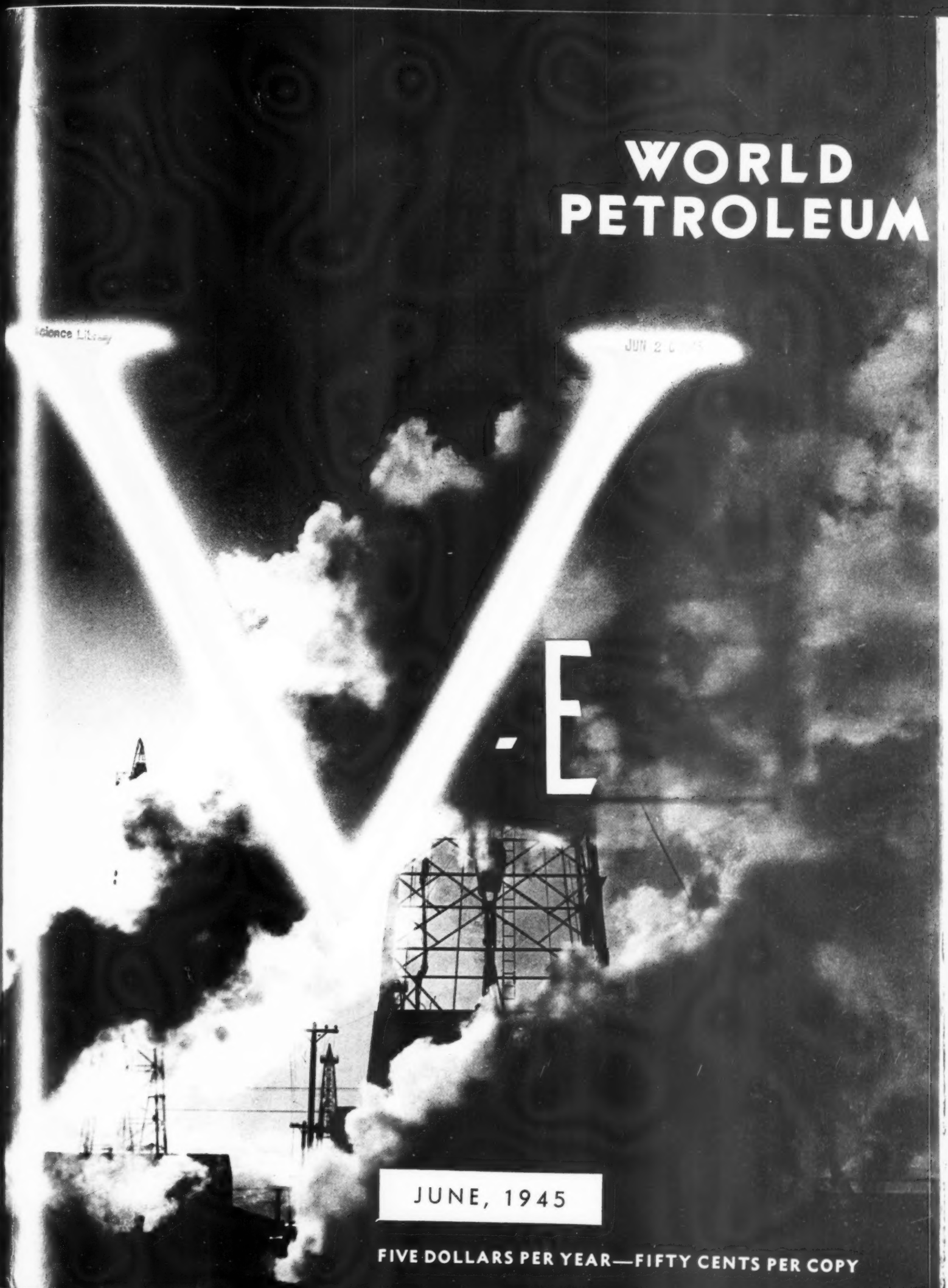

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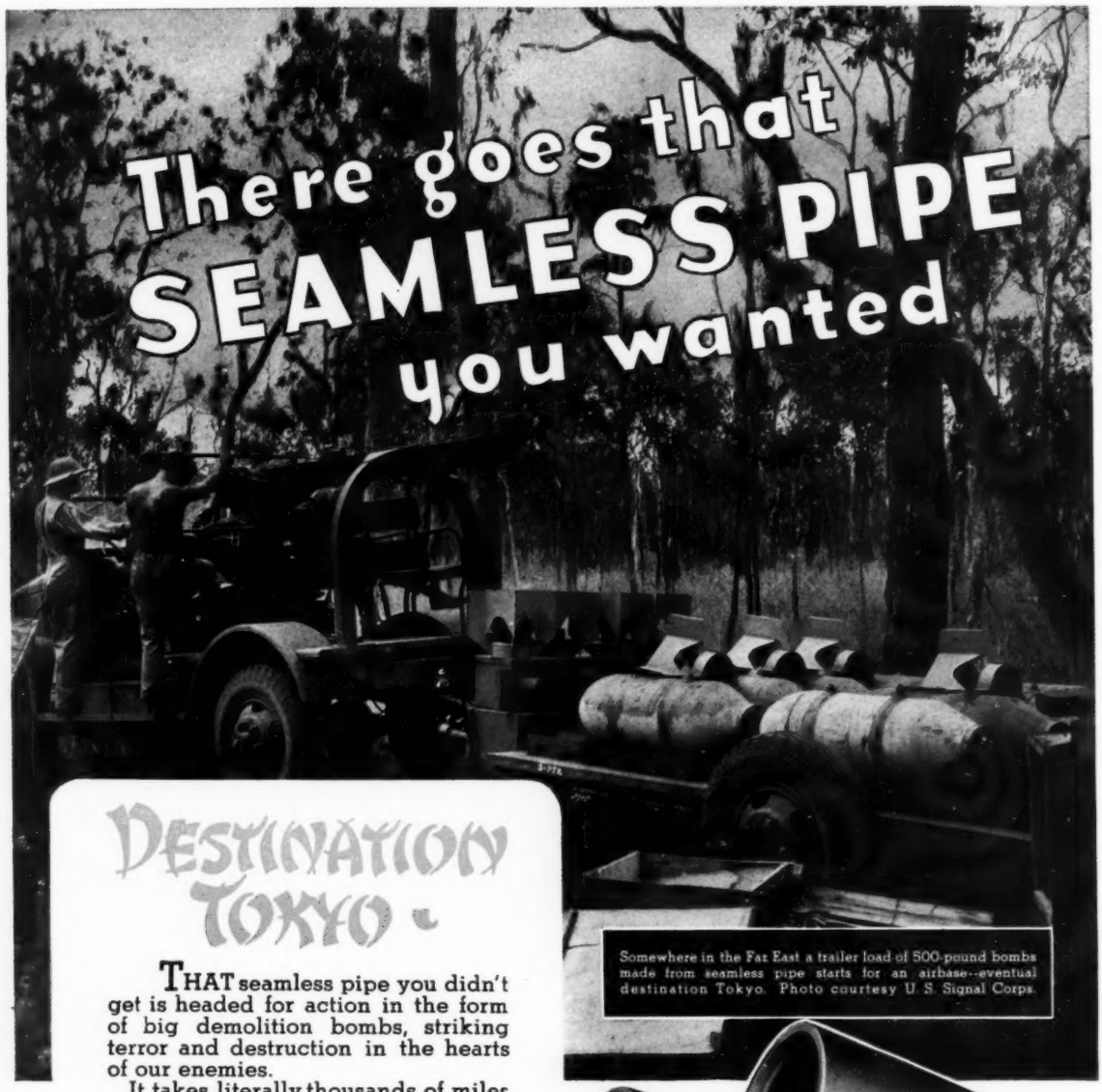

Somewhere in the Far East a trailer load of 500-pound bombs made from seamless pipe starts for an airbase--eventual destination Tokyo. Photo courtesy U. S. Signal Corps.

DESTINATION TOKYO

THAT seamless pipe you didn't get is headed for action in the form of big demolition bombs, striking terror and destruction in the hearts of our enemies.

It takes literally thousands of miles of this big-diameter seamless pipe to supply the bombs that are clearing the way to Tokyo. Our mills have been running to capacity in an effort to supply that seemingly insatiable demand, as well as your requirements for Oil Country Goods and other seamless pipe.

One of these days, Victory will come. Then we will serve you, as in the old pre-war days--furnish you dependable seamless, of finest quality, in the sizes and quantities you want. Until then we are doing and shall continue to do our best to meet each customer's urgent needs.

*Youngstown Seamless Pipe is identified by the orange band markings.

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WORLD PETROLEUM

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PUBLISHED BY MONA PALMER

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

VOLUME 16 | JUNE, 1945 | NUMBER 6

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SUBSCRIPTIONS: Annual subscription is offered at the flat rate of $5.00 (U. S.) postpaid. Single copies are obtainable at 50 cents. • Address all correspondence regarding subscriptions to the publishers at Orange, Connecticut, or 2 West 45th Street, New York 19, N. Y. Address all correspondence regarding editorial and advertising matters at 2 W. 45th St., New York 19, (Tel. MUrray Hill 2-7333). Published by Mona Palmer Trustee under the will of Russell Palmer.

BRANCH OFFICES: London: Georgian House, St. James, London, S. W. 1 • Mid-Continent Advertising Manager: O. F. Cozier, 415 McBirney Bldg., Tulsa 3, Okla. (Tel. 4-5555) • Mid-West Advertising Manager: Willard R. Cotton 307 No. Michigan Ave., Chicago 1, Ill. (Tel. Franklin 2508) • Michigan Manager: R. F. Pickrell, 314 Stephenson Bldg., Detroit 2 (Tel. Trinity 1-0790) • Cleveland Advertising Manager: Frank J. Enright, Union Commerce Bldg., Cleveland 14, Ohio (Tel. Main 5693). Western Advertising Manager: Walter S. Johnson, 412 West 6th Street, Los Angeles 14, Calif. (Tel. Mutual 1391).

EDITORIAL

OIL INDUSTRY FACES WEST FOLLOWING V-E DAY

V-E DAY'S effect upon the petroleum industry has long been discounted by American oil men. Its observance brought them no relaxation for they realized that it carried no lightening of the responsibility that war had placed upon them, that in some respects demands would be heavier and difficulties greater in the days that lay still ahead.

In the earlier days of the war and in pursuance of the policy then adopted of treating the Axis powers in Europe as the enemy first to be overcome efforts were centered upon moving the greatest possible volume of petroleum products across the Atlantic in the shortest possible time. The most powerful air force the world ever had seen was concentrated there. Thousands of ships were put into service to move millions of fighting men and all their equipment and supplies across the eastern ocean. All this vast mechanism depended upon oil for movement and for power. The battle of the Pacific was not overlooked but it was deliberately relegated to a secondary position until the foe regarded as the more powerful could be brought to defeat. Consequently, the marshalling of the forces of petroleum was directed primarily to meeting the huge demands of the transAtlantic struggle. The new arteries of transportation that had to be created to meet military requirements ran from west to east. Great supply depots were established near Atlantic ports and the heavy tide of war traffic flowed across the country and across the sea to the battlefields where the heaviest fighting forces were engaged.

Suddenly now the centre of operations has moved westward twelve thousand miles. The clouds of planes that turned German cities into hopeless rubble heaps are to spread like devastation over the areas still held by Japan. Most of the men who beat Italy and Germany to abject subjection are to extend their might against the enemy across the Pacific. The task of moving this great war machine to a new theatre of operations is in itself a tremendous one. The task of keeping it supplied raises new and difficult problems of logistics. No pipe lines lead across the continent to the Pacific. The capacity of the railways in this western area is far less than that of eastern roads. The Atlantic seaboard will still be the point of departure for a great bulk of munitions and supplies which means that a greater tonnage of shipping will be required to move the same volume of materials over the longer route.

In the matter of petroleum production no substantial change is anticipated through the shift in the war's center of gravity to the west. Since the pattern of aerial attack followed so successfully in Europe is to be employed with an equal number of planes no decrease in the requirements of aviation fuel is to be looked for. Demands for Diesel and fuel oil for use of the Navy and merchant marine are likely to grow heavier rather than to decrease owing to the changed transportation situation already referred to. In one respect, however, there should be an appreciable falling off in the consumption of liquid fuel for military purposes. That is in the use of ordinary motor fuel. In the invasion of Europe an important function was performed by trucks, jeeps and other cars that moved men and supplies at high speed over great distances on the hard roads that abound on that continent. Thus far the fight against Japan has been featured primarily by landing operations chiefly involving naval craft and amphibious machines. Even when the war moves into the Japanese home islands or the continent itself the scope of usefulness for road vehicles will be limited by the lack of highways.

Therein lies the hope of the civilian population of the United States for a more liberal allotment of motor fuel than they have had during the past three years. Too great expectations should not be built upon this prospect. Representatives of the Office of Petroleum Administration are wary of promises but have spoken hopefully of the possibility of some slight relaxation of rationing in the next month or two.

Facing the oil industry as a whole is the virtual certainty of unabated pressure with operation of all its facilities at top capacity until the war in the Pacific draws to a close. Many fields will continue to produce above their maximum efficient rate. Refineries will work to the limit. The transportation situation will be difficult and restrictions upon travel and the shipment of goods within the country will be maintained. Progressive easement in the War Production Board's restrictions on materials will help the drilling situation as more tubular goods are made available and equipment manufacturers will be put in a better position to fill orders as their supply of metals increases. Gradual improvement in the manpower supply which has been one of the industry's vexing problems should take place as the Army's program for the release of two million service men progresses. This will be a slow process, however, because of the time required to move this number of men back to their homes. Aside from such minor ameliorations the only important change that V-E day has brought to the oil industry is a reversal of the direction in which the main current of war supplies must flow and not at all in the tensity of war demands.

Interior of a Main Pump Station,
War Emergency Pipe Lines.
(Photo Courtesy Standard Oil Co. (N. J.)

SIGNIFICANCE OF THE BIG INCH PIPE LINES

ON July 19, 1943, near the little town of Phoenixville, Pennsylvania, a notable gathering of men representing the oil industry and federal officialdom watched the burning of the last bead in the main line of the first War Emergency Pipe Line, more affectionately known as the Big Inch. Just 350 days before the first of more than 200,000 welds had marked the start of the line, more than 1200 miles away in Texas.

Into those 350 days had been compressed an epic industrial achievement, the building of the world's greatest pipe line in record time—a line that struggled through swamps, sped across level prairies, dived under thirty large rivers not to mention some hundreds of smaller streams and climbed two mountain ranges amid the snow and ice of the worst winter experienced in many years. It was a triumph of careful planning, of efficient organization and above all of dogged determination on the part of an army of workers who balked at no obstacle and whom nothing could defeat.

Within another twenty days the feeder line to the Philadelphia and New York Harbor refining areas were completed and a river of East Texas crude was flowing uninterruptedly to stills on the Atlantic Seaboard. But by that time the men who laid the Big Inch had moved on to another task, that of running a companion line of greater length but slightly smaller diameter, the Little Big Inch, which was to parallel its big brother and add upward of 200,000 barrels of products to the daily eastbound flow.

Little Big Inch was pushed through at even greater speed than its forerunner. Its 1475 mile course was covered in 225 days and on March 2, 1944 it began deliveries to its eastern terminal at Linden, N. J., just in time to help prevent a threatening fuel oil shortage along the East Coast. Since that time the two have worked together, along with other linked-up systems to oil the European struggle and serve the imperative needs of a multitude of eastern war plants.

This great transportation project did not spring full-fledged into being. Back of its inception was a swift moving series of developments out of which came the realization that a new type of war had come into existence, a war of machines —fast moving, hard hitting and powered with petroleum. Thus was the German blitz designed. Oil was a factor of primary importance in World War I but in World War II its possessor held the key to ultimate victory. Fortunately for America, in pre-war years the petroleum industry had developed extensive reserves which were ready to release oil at a greater rate than they had ever been called upon to produce before.

Production was not the only problem. Transportation was equally important. Back in 1941, as war grew progressively more certain, leaders in government and industry made plans to keep our industrial machine in high gear. Upon this depended our ability to meet the challenge of a potential enemy who was rapidly destroying the civilization of Europe and casting envious eyes toward the Americas.

It was recognized then that once the United States became involved in the spreading conflict the ocean tankers which constituted our peace time problem transportation system to the Atlantic Seaboard would be vulnerable to prowling submarines and would be subject to requisition for moving oil to battlefronts far removed from our land. To offset this possible failure, the need to build a substitute overland transportation system—one which the submarines could not reach—became a clearly defined problem for immediate consideration and solution. Big pipelines, three to four times larger in capacity than any built heretofore for oil transportation—lines from Texas to the East Coast with terminals 2000 miles nearer to the European war front—would reduce our dependence on the tanker to a minimum. Here was a problem to tax the imagination and the courage of the petroleum industry.

Faith in American ingenuity and ability was basic in the minds of leaders who came forward and dispelled doubt. The petroleum industry gave convincing proof that it was anxious and ready to undertake this gigantic task. Eleven oil companies formed National Defense Pipelines, Inc. and pledged $80,000,000 of industry capital to build these pipelines as a contribution to preparedness. But steel for their building could not then be spared and the realization of the lines was greatly delayed. The events of December 1941, and the following months made the creation of a new transportation system imperative but the petroleum industry, now going all-out to convert itself into a war machine, was no longer so well equipped to build giant pipelines with private funds. Government then stepped in with the money and requested the industry to do the job.

War Emergency Pipelines, Inc., made up of the same companies that had earlier formed National Defense Pipelines, Inc., contracted with the government to act as its agent entirely without profit in building the "Big Inch" line from Texas to New York and Philadelphia. Later the same company built the "Little Big Inch" products line from Texas to the East under the same no-profit terms. The construction of these lines called for the best that the industry could provide in engineering talent and pipeline constructors. Closest cooperation between industry and government was essential. These requirements were met in a highly commendable way and the result was another brilliant chapter in the development and servicing of the American war machine.

Today, these lines have completed a great part of the task which they were built to perform. They are quiet yet virile, pulsing arteries delivering to Eastern terminals more than 500,000 barrels or about 22,000,000 gallons every twenty-four hours. From the beginning of operations through the month of April, 1945 they have transported in excess of 300,000,000 barrels of crude and refined petroleum products to the East, a volume sufficient to have met the total demand for oil in District One (the 17 Atlantic Seaboard states and District of Columbia) for 200 days during the last unrationed peace time year of 1941. From an economic standpoint the lines already have saved the people of the United States sufficient amounts when compared with railroad rates to entirely pay the cost of building and operating the systems.

These two "Big Inch" pipelines have made a major contribution to the successful prosecution of the war. Every beat of their stout hearts shortened the conflict in Europe. Without them the conclusion of the struggle in that theatre might have been disastrously delayed and certainly the industrial East with its vital war plants would have been relatively paralysed. The lines have been well described as life lines and life lines they have been. Precious American lives have been saved because of them. Through them the armed forces of the Allies have received huge quantities of oil—always enough and always on time. Because of the distance and time saved in the delivery of this oil to the fighting fronts, battles were won that might have been lost and victory was achieved much sooner than could otherwise have been done—if it could have been done at all.

Now that the European war has reached its close it becomes possible to form a more accurate appraisal of the part played in it by these great transportation arteries built in the midst of the conflict in a race against time. To say that they have exceeded the most optimistic estimates made for them would be a gross understatement. Though their mission is not ended this second anniversary in their useful lives seems an appropriate time to review their achievements and to pay tribute to the men who planned and built them, all of whom may feel a well earned pride in the record that has been established. They have been true soldiers of the nation and the soldiers in the forward lines have been the beneficiaries. This, we are sure, will be their chief satisfaction.

PAUL BUNYAN UNDERGROUND

By Charles Morrow Wilson

Now Two Years Old "Big Inch", With its Younger Companion, "Little Big Inch" Has Delivered Over 300 Million Barrels to East Coast and has Sustained the Tremendous Pace of Allied Military Operations in Europe.

W. Alton Jones

Burt E. Hull

Harold L. Ickes

FOR the petroleum industry June is another month studded with significant birthdays and anniversaries. For the best of reasons most of these petroleum milestones are being commemorated only by more days and nights of hard work and hard fighting.

That goes for the second busy birthday of the Big Inch pipe line, 24-inch war emergency carrier that stretches 1253 miles from Longview, Texas, to Phoenixville, Pennsylvania, and thence by about 230 miles of 20-inch extension lines to the Philadelphia and New York areas, to prove itself the world's biggest oil carrier—the Paul Bunyan underground.

The Big Inch, and its equally amazing side kick, the Little Big Inch, the 20-inch, America's longest (1475 main line miles) products carrier system, now carrying gasoline for war and house-brand gasoline for the home fronts, combinedly greet this victorious June with a throughput of East Coast deliveries totalling approximately a quarter billion barrels of crude and ninety million barrels of vitally needed products. These are petroleum tallies for war. Hitler and Hirohito never saw the underground giants that are helping so ably to deliver the epochal Axis knockout. But der fuehrer, the sun god emperor and all the little men about them have or are feeling their effect the really hard way.

This is apropos of the fact that pipelines have been vital to the winning of World War II. According to reliable estimates, approximately a third of a million miles of pipelines have carried or are carrying essential power fuels and water to United Nations forces on at least fourteen battlefronts. Last year approximately 146,000 miles of long distance oil pipelines in the United States handled almost 140 billion ton miles, to more than double their 1939 total load and to prove oil pipelines this nation's third largest freight carriers.

Mr. Wilson is a well known writer and foreign correspondent, author of numerous books among the more recent of which are "Trees and Test Tubes, the Story of Rubber,"—"Ambassadors in White, the Story of American Tropical Medicine,"—"Central America, Challenge and Opportunity," and Roots of America."

Most of the battlefront pipelines are or have been of comparatively small diameters and laid hurriedly on the surface, but combinedly they have carried tens of millions of barrels of high-octane gasoline, Diesel fuel, water and other products to the greatest armies that ever walked or rode on earth; to the mightiest air corps that ever lifted wings and to key components of the U. S. Navy, mightiest sea force in history.

During this maximum war of fast motion and prime movers, pipelines have sucked in and delivered a principal share of the fuels that have kept as many as ten thousand combat aircraft in action over the western front during a single day; that have kept moving the hundreds of miles of tank and troop columns which swept over France and presently cut up Germany like carving an Oklahoma pie.

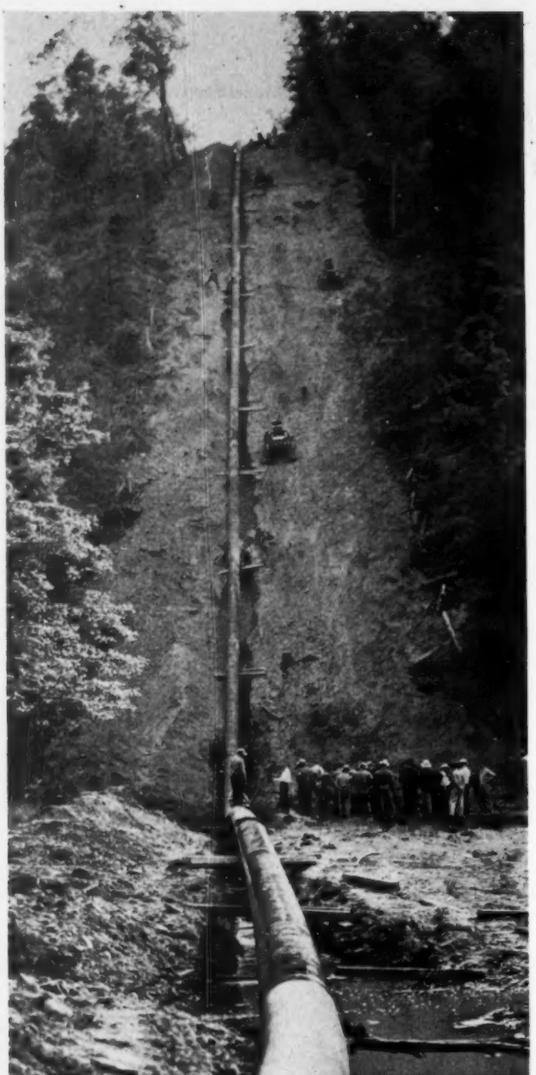
Petroleum products in pipelines, as in tankers and transport planes, have followed or led our marines, doughboys and Navy task forces over vast reaches of the Pacific. They are powering the hundreds of B-29's and fighter escorts that are blasting the Setting Sun into total eclipse. Slim surface pipelines helped Stilwell's men push through to the Burma Road. They helped make possible winged victory over Africa, paced the riproaring sallies of Patton's Third Army, and are otherwise serving the best traditions of fighting Americans, which is appropriate because pipelines are uniquely American.

Eighty-five years ago an American general, S. D. Karns, recommended the underground metal pipeline as the best carrier of water and oil for armies in the field. Before the Civil War's end an iron pipe line was actually carrying Pennsylvania crude oil to Pennsylvania customers despite the threats and uproars of the embattled teamsters who protested that the insidious pipes were wrecking their business.

Mussolini and Hitler could have said the same, and Hirohito could very well lodge the same complaint today. One of the least-noticed great stories of World War II is a pipeline story, dating back to one of history's darkest days, July 3, 1942. Major P. W. Rainier, of the Royal Engineers and the command staff of the British Army that stopped Rommel at El Alamein, tells it.

On July 3, 1942, parts of three of Rommel's Panzer division—at least 5,000 men and fifty Mark IV tanks—plunged through the British center and roared over half the fifty miles of searing desert between Alamein and Alexandria. Rommel's men actually saw the spires of Alexandria, whose capture would have put Britain out of the Mediterranean, out-flanked Russia, linked "Greater Germany" with "Greater Japan" and might even have lost the war for our side.

Though short of petrol and for at least thirty hours without drinking water, the Korpsmen pushed on to attack a battle-weary and weakening defending force of British. As they advanced the Panzer men came upon an exposed stretch of six-inch pipeline. They began shooting holes in it, and when water spurted out the Germans ran frantically to drink.



Carrying "Big Inch" Over a Mountain on Its Eastward Course.

Their throats were so badly parched that they could not immediately detect that the line carried sea water. An experienced pipeliner, Major Ranier had been testing the new surface line hydrostatically. With fresh water desperately scarce, he had wisely and most luckily used salt water. The Panzer men went mad from drinking it. At one urge some 1100 of the 90th Light Panzer Division, elite of the Afrika Korps, stumbled across the sands with raised hands, and swollen, bloody tongues lolling from their tortured mouths. Hundreds more surrendered for the hope of a drink of fresh water. As for taking Alexandria, the Nazis were out of luck. Their assault was ended. Their Mark IV's not abandoned, lumbered back in retreat. Largely because of one stretch of pipeline under test, Herr Rommel's goose was cooked.

The more recent stories of the Big Inch and Little Big Inch, underage daddies of war-use pipelines, are less dramatic but just as decisive. Both are civilian-made wonders of American skill. Both were built and operated without profit to their designers, builders and operators, the petroleum industry, during the period of crucial need.

The two big lines are materialized largely from the determined and able work of three Americans; W. Alton Jones, president of Cities Service, who actually leads the job; Secretary Harold L. Ickes, Petroleum Administrator for War, who fought and slashed through many obstacles to get the job started and to keep it going; and Burt Hull, president of the Texas Pipe Line Company and dean of pipeline builders, who superintended the record-smashing construction. Substantial credit is due others, including the Hon. Jesse Jones, the eleven petroleum industry leaders who contributed their skills and services gratis, and the able hard-working staff of the non-profit company, War Emergency Pipelines, Inc., which heads the building and operation of the big lines. Credit is also due more than a hundred suppliers and contractors who put their shoulders to the wheels while the big lines were under construction.

The story of the Big Inch actually began during 1940. In July of that year, Secretary Ickes reported to President Roosevelt that the building of a crude oil pipeline from Texas to the East might prove "absolutely necessary" in the event of an "emergency."

As 1940 became a tragic past, Americans began to hear used the word "emergency" more and more frequently. It was in the air and on the darkening horizons. During May, 1941, eight senior executives of seven major petroleum companies, Standard of New Jersey, Consolidated, Atlantic, Cities Services, Socony-Vacuum, Sun and Tidewater, met in New York to discuss the possibilities of major emergency pipelines. The group recommended the construction of a 24-inch crude line from Texas to the East Coast. Early in July, 1941, following a gathering at Washington on call of Deputy Petroleum Administrator Ralph K. Davies, the companies' representatives again met in New York, elected W. Alton Jones chairman, and named a legal committee and a technical committee to begin additional studies of the proposal. The industry group proposed to build the big line with its own capital, and to that end organized National Defense Pipelines, Inc., with potential working capital of approximately $80,000,000. But when the industry group, officially seconded by Secretary Ickes, applied for priority for the necessary steel, the application was denied. Nevertheless, the oil men kept the issue open, and set about making an aerial survey of possible routes and attending to other necessary preliminaries.

During September, 1941, a renewed application for priority in obtaining the needed steel was again rejected. Pearl Harbor was the lightning flash that etched sharply the desperate perils to adequate petroleum transport, perils which earlier had been clearly realized by industry leaders. The Monday following that memorable and bloody Sunday saw the first meeting of the Petroleum Industry War Council. The Council had plenty to worry about. Within sixty days Nazi submarines were sinking tankers within sight of American shores. By March, 1942, packs of Hitler's sea wolves were blasting our tankers wholesale in the Gulf, the Delta, the near Caribbean, off Hatteras, and virtually within sight of the Statue of Liberty. It was considerably like spearing fish in a rain barrel. Valiantly and brilliantly, U. S. railroads began shuttling their tank cars.

But an acute transport situation was growing desperate. Tankers that escaped the U-boats were being put to vital war runs. Even the inspired performance of the railroads could not carry the whole war petroleum load indefinitely.

During April, the Petroleum Industry War Council appointed a Temporary Pipeline Management Committee, with W. Alton Jones chairman and a pipeline engineering sub-committee headed by W. R. Finney. Early in May, the Office of Petroleum Coordinator gave official sanctions to industry committee and sub-committee appointments, and approved the emergency projects, including the building of big-diameter crude and products lines from the Southwest to the East, as recommended by the petroleum industry group.

At last the light was green. On June 10, 1942, WPB approved allocation of 137,500 tons of steel for building a first section of the 24-inch line from east Texas to southern Illinois. The following day Secretary Jesse H. Jones advised that the RFC would grant loans for constructing the first section. On June 19, Chairman W. Alton Jones called in New York a meeting of the managing sub-committee, with representatives of eleven signatory companies present. The group drew up working plans whereby the Defense Plant Corporation would provide the money necessary for construction and contract with War Emergency Pipelines, Inc., the non-profit corporation, to build and later to operate the super-pipe line. The participating petroleum companies supplied their best experienced men gratis and gave preliminary plans and service without cost to the United States.

July 1, 1942 saw the mightiest of pipeline jobs being readied for action, with B. E. Hull as general manager and A. N. Horne, his assistant. By July 19, the National Tube Company had manufactured and shipped the first trainload of 24-inch seamless steel pipe in 40-foot lengths. On August 3, 1942, the first joint of pipe was laid near Little Rock, Arkansas. By October 27, as many as nine miles of the giant pipe were being welded and laid in a single day. Before

the year's end WPB had allocated sufficient steel, and the same War Emergency Pipelines, Inc., with Atlantic Pipeline, Cities Service, Sinclair, Gulf, Pan American Petroleum, Shell, Socony-Vacuum, Standard of New Jersey, Sun Pipeline, Texaco and Tidal as stockholders, had contracted to extend the Big Inch to the Atlantic Seaboard.

As 1942 ended, War Emergency Pipelines, Inc. began pumping oil into the Big Inch at Longview, Texas, less than five months after the first 3784-pound length of the big tube had been buried. Burt Hull and his far scattered field forces, which presently grew to a maximum strength of about 15,500 (earnings a total of approximately $1,000,000; setting about $2,000,000 worth of materials per week), plowed into and through a remorselessly rough Alleghany winter.

But the Big Inch pushed on—over mountains, under thirty principal rivers and streams, and about 200 smaller streams, under hundreds of road and railroad crossings; eight carloads of 250 tons of the giant seamless pipe per main line mile, for an over-all daily stint of about 3.6 miles of main line. Pipeline history was being written the hard way, and fast. The needed construction equipment was scarce, and available equipment required hasty revamping to handle the giant overweight tubing.

On February 13, 1943, the emergency builders completed the test on the first 539-mile section of the Big Inch from Longview, Texas, to Norris City, Illinois. Spring brought torrential rains and floods, but the work went on. There were a few accidents and some setbacks. For example, on May 17, an Arkansas River flood broke the big line near Little Rock. Burt Hull's men threw in an eight-mile emergency loop, swung it across the Rock Island railroad bridge, and in less than a week the Big Inch was in service again.

From February 19 on daily tank car loadings kept rolling out of the Norris City terminal to meet the most acute needs for oil. By the end of June, 1943, the Big Inch had already put through about 21,000,000 barrels of crude which was moved on from Norris City by tank cars, pending completion of the eastern extension. On July 19, 1943, Burt Hull's men made the final weld of the Big Inch mainline at Phoenixville, Pennsylvania, just 350 days after the first length of pipe had been laid. That was a record to crow about, and War Emergency Pipelines, Inc., at a public ceremony at Phoenixville, was awarded a well-deserved citation by the Petroleum Administrator. The official estimated cost of the completed line was $90,000,000. Working at top speed, against war-time prices and a prevalent war-time urge to get results regardless of the expense, using and adapting any available equipment for laying the unprecedentedly big and heavy line, the actual completion cost was about $76,000,000.

Hundreds of Streams Were Crossed by Emergency Pipelines.

First Tank Train Leaving Norris City Terminus of First Section of "Big Inch."

The 20-inch extension lines to the New York and Philadelphia area were rushed to completion. On August 14, 1943, first oil went through to Philadelphia refineries. Shortly thereafter the line load reached refineries in the New York area.

The Big Inch, world's biggest petroleum carrier, was completed and set for action; 360,000 tons of steel; 300,000 barrels per day rated capacity; almost 4,000,000 barrels content load; a total

tank storage of only less than 4,000,000 barrels; 26 main line pumping stations, an average of 52 miles apart, each manned by three or more 1500-horsepower electric motors driving centrifugal pumps that take in the crude at 30-pound pressure and discharge it from the station at around 725 pounds.

* * * * *

Meanwhile, the Little Big Inch, the 20-inch products line and longest of all American petroleum carriers (1475 miles of 20-inch main line from Baytown-Houston, Texas, to Linden, New Jersey; plus 170 miles of feeder lines in the Baytown-Beaumont area, plus about 100 miles of extension in the Linden area), was materializing—being built, as was the Big Inch, for the United States Government and without profit to the petroleum industry.

On January 6, 1943, the Temporary Joint Pipeline Management Sub-committee, also headed by W. Alton Jones, approved the construction of a 20-inch products line to pick up southwest refinery outputs in the areas of Baytown, Beaumont and other Texas Gulf points; also from Lake Charles and other Louisiana areas, thence carrying across East Texas and Louisiana to join the Big Inch right of way at Little Rock, Arkansas.

To start the job the Petroleum Administrator applied for critical materials for building the initial 836-mile section to Seymour, Indiana. WPB approved, and on February 10, 1943, War Emergency Pipelines, Inc. contracted to build and later to operate the products line.

Within another six weeks trainloads of 20- inch tubing were rolling to location, and WPB had authorized release of critical materials for building the long line to the East Coast. After a record-breaking 225 days of construction, the Little Big Inch was completed. Its estimated cost had been $75,000,000; the actual cost was about $65,000,000.

Stretching 287,000 tons of steel across half the continent, and bolstered with about 3,000,000 barrels of tank storage, it delivers a rated capacity of 235,000 barrels of gasoline daily; with loads moving at the rate of 122 miles per twenty-four hours, propelled by 29 pumping stations powered by a total of ninety-eight 1250-horsepower electric motors.

On March 2, 1944, the Little Big Inch began delivery of a first throughput of 128,000 barrels of gasoline to Linden, New Jersey. Immediately behind the gasoline came a welcome stream of fuel oil just in time to ease and presently to tide over the most acute fuel oil shortage in East Coast history. Then the prodigious infant began proving its talents for quick and easy change-overs to gasoline and other war-winning products. To date, 100 octane gasoline, for winged victory, has been its biggest load—about one-third of total deliveries. Eighty octane is another highly important cargo. Currently the line is delivering various grades of gasoline which total around 235,000 barrels per day. Meanwhile, the Big Inch is regularly delivering to refineries in the Philadelphia and New York areas a daily total of about 325,000 barrels.

Big Inch and Little Big Inch have already written a great deal of petroleum history, and perhaps some notable lines of world history. Foaled to meet a desperate national need, the new giants are prime contributors to petroleum transport to and for war. They have helped mightily in blotting out those blighting phrases "too little" and "too late". Though comparatively little noticed in the news columns, they are revamping the story of subway transport. The two big lines have set the pace for stepping up the pre-war trickle of about 53,000 barrels per day of pipe line deliveries to the East to a current and continuing total of more than 700,000 barrels per day.

The big new lines are thereby helping round out a mammoth supplying job for which no other transport medium has been available during these crucial times. In terms of cost differential between pipeline transport and railroad tank car haulage (had sufficient tank cars and rail space been available—and they were not and are not available), Big Inch and Little Inch have already paid for themselves 100 percent, with money to spare.

As emergency public facilities, planned, built and operated without private or corporate profit, but with the guidance and organized cooperation of the petroleum industry, by way of principal companies and signatory executives thereof, the two big lines exist and work as public resources. Purchase of the petroleum and products involved is by Defense Supplies Corporation, under direction issued by the Petroleum Administrator. Defense Plant Corporation owns the lines and leases them to Defense Supplies Corporation. War Emergency Pipelines, Inc., continues to operate the mammoth lines solely for the benefit and profit of the United States. Up to date the major portion of all oil and products handled by the lines has been for emergency and executive agencies of the federal government. On V-day, or for that matter today, the Big Inch and the Little Big Inch could be written off the books with memorable and decisive good to the cause, people and government of the United States. But will the big lines be written off? This is for time, Congress, and more importantly, for the United States public to decide.

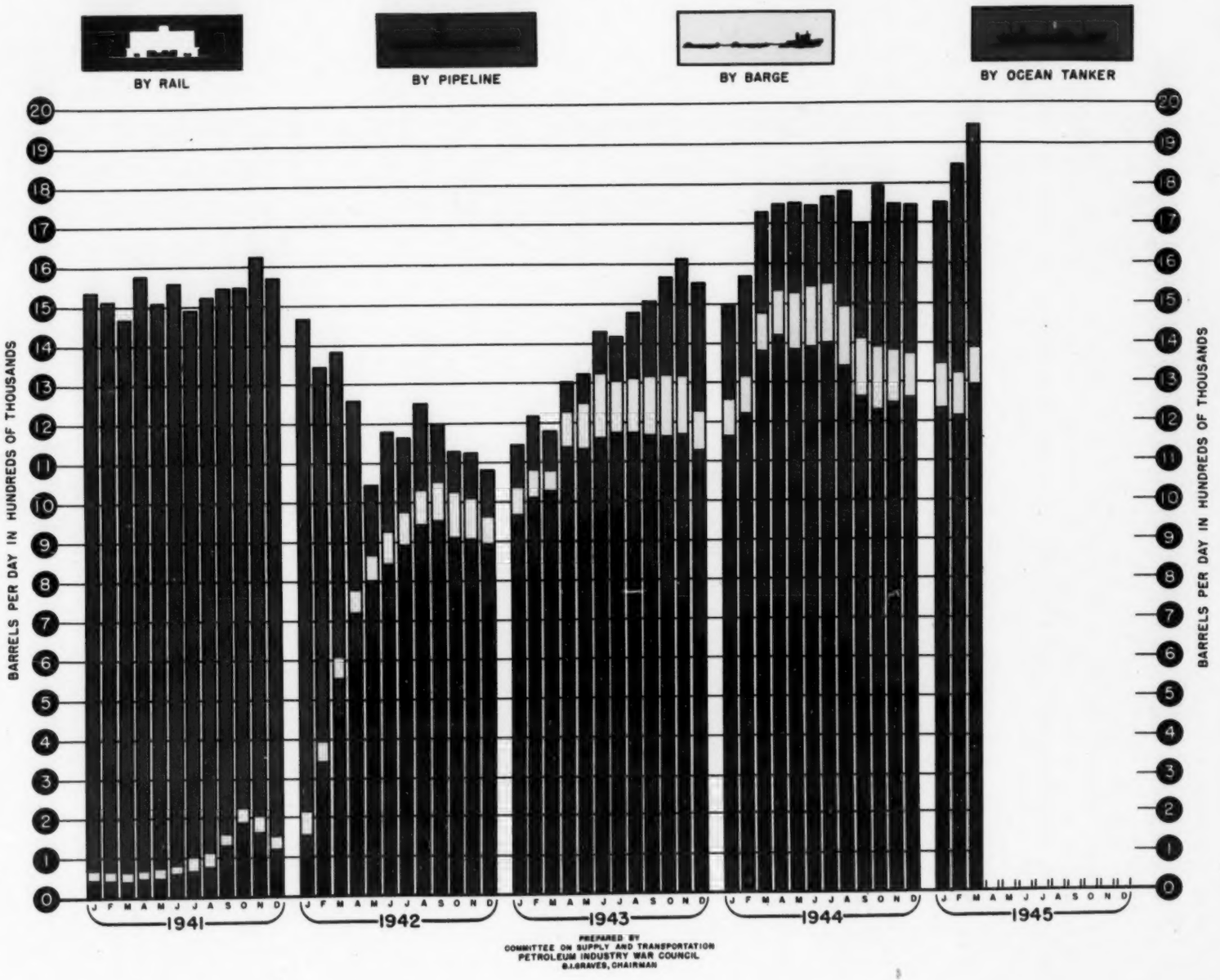
The decision is important. One can spend weeks, or months, studying the records of the many official hearings and the background facts related to the new pipe lines. Whatever one's particular views or fields of interest may be, the fact stands that the petroleum industry has sired the pipe line as an efficient and low-cost carrier. Realistic advocates of continued national defense, citizens as well as military experts, now know the crucial value of efficient pipe line systems in any over-all plan of preparedness. Experienced financiers, including the Hon. Jesse H. Jones, believe that the new big lines are commercially and competitively sound. Great numbers of "everyday citizens", pri-primarily interested in their own and what they consider the common good, look askance at scrapping the two new super lines that are so clearly proved as reliable and low-cost carriers, from the great southwestern fields to major populations of the East who are destined to remain in need of more and cheaper fuels. The place and possibilities of the Big Inch and the Little Big Inch in the furtherance of sound peace-time economy involve the efficient fulfillment of many big and durable jobs; such as servicing the vast post-war expansion in commercial aviation or helping to salvage and make practicable for peace-time operation hundreds of war factories and defense plants for which our government and citizens have paid billions.

In addition, the Big Inch and the Little Big Inch have roused many types of professional and technical interests. They have proved a distinguished venture in skilful organization. They are memorable from a standpoint of legal administration. They have written an outstanding story in the efficient consumption and use of electric power. Combinedly, the two underground Paul Bunyans use a quarter-billion horsepower of electric motors; consume more than 4,000,000 kilowatt hours daily, the equivalent of normal electrical consumption of the entire Cincinnati area. They employ more than twice the total generative capacity of Norris Dam of TVA, and prove to be the nearest ideal and uniform consumers of power loads.

The "Big Inchers" are among the truly great provers of hydraulic engineering and automatic operations. One appreciates this when he observes their inter-communication systems, button pressing efficiency, warning lights, buzzers and other automatic notification to station operators as to the source of trouble; or their astonishingly effective devices for spotting content slugs.

One appreciates the accomplishment all the more when he realizes that America's two greatest subway pipelines for oil are the continuing result of thousands of Americans—Indians, negroes and white men alike—working together with hundreds of skills. That is still another reason why the Big Inch and the Little Big Inch are important to America tomorrow as well as today. Whatever their future may be, the big lines have been and are tremendous contributors to successful prosecution of the war, and they are working monuments to the indomitable spirit of the men who overcame an uprooting of our normal transport system in such an unbelieveably brief period of time.

DELIVERIES OF PETROLEUM INTO PAW DISTRICT NO. 1



One of the Largest Main Pump Stations of the War Emergency Pipeline System. (Photo Courtesy Standard Oil Co. (N. J.)

Operation of War Emergency Pipelines

By J. M. Williams

Vice President and Manager of Operations
War Emergency Pipelines, Inc.

J. M. Williams

WHEN the last bell hole weld was made on the War Emengency Pipeline system, there came to an end one of the most gigantic pipeline construction jobs ever conceived by man—the two largest liquid pipelines ever built, stretching halfway across a continent and so vitally needed for the proper prosecution of the war. With the end of the construction work there came into being a new problem, as large in its particular field as the construction of the pipeline had been. That problem was the operation of the two systems. The trunk lines themselves, the world's largest, are served by gathering systems and distribution systems larger in diameter and longer in length than a great many trunk pipelines. The lines had been built at great cost to feed the maw of a gasoline and oil hungry war machine and great things were expected of Big Inch and Little Big Inch. The story of how these two steel arteries were transformed into a coordinated and integrated transportation system we propose to tell here.

The job could never have been done if a few of the oil companies involved had not cooperated in giving freely of their trained personnel and real American "know how", all of which had been acquired by the contributing companies at considerable cost and over a long period of time. Indeed the knowledge and experience represented for the contributors a distinct advantage in the operation of their own systems over their competitors, but it was made available to War Emergency Pipelines in the interest of the common good to bring into being a transportation system which has transported over half a million barrels of petroleum and petroleum products to the east coast every day since the facilities were available.

A great deal has been written about the construction and engineering features of War Emergency so that no reference will be made to the construction features in this article. I think it is safe to suppose that almost everyone in the oil industry in the United States is familiar with the route traversed and the areas served by the two pipelines. However, for a better understanding of the operation, complete maps of the system showing both the main trunk lines and the distribution systems are included. Plate 1 shows the route of the two main lines, the location of the various pumping stations and the operating area which it is the duty of each of the six divisions to maintain through a coordinated maintenance program which is directed from the main office at Cincinnati. Plate 2 represents the crude gathering system. Plate 3 shows the gathering system for the 20" products line and Plate 4, the distribution systems in the New York and Philadelphia areas. It can be readily seen that the operation of the distribution systems and the two rather elaborate gathering systems is quite a gigantic coordinated undertaking. In fact, unless these facilities operate smoothly, the main line itself cannot be operated in an efficient manner.

It is with pardonable pride that we recount some of the problems that presented themselves in the early days of the operation of Big and Little Big Inch and to describe the methods which made the operation possible.

Most organizations as large as War Emergency Pipelines, Inc. evolve slowly through the years. It is hard to conceive of a plant costing in the

Plate 2—Crude Gathering System of Big Inch.

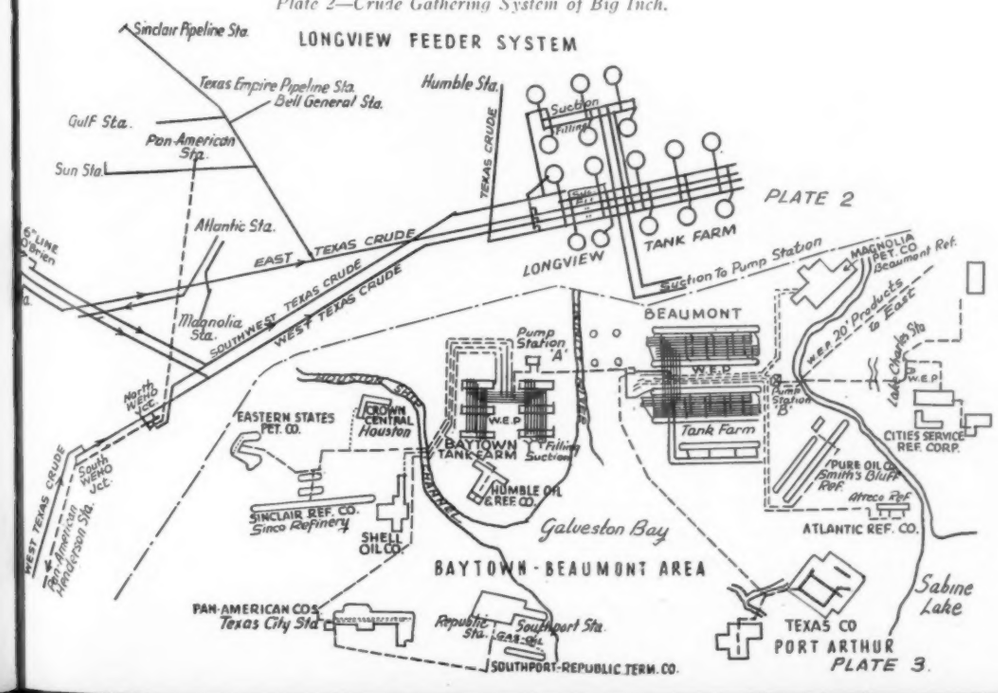


Plate 3—Gathering System of Products Line, Baytown-Beaumont Area.

Plate 6—Dispatching Office at Cincinnati; Products Line Left, Crude Line Right.

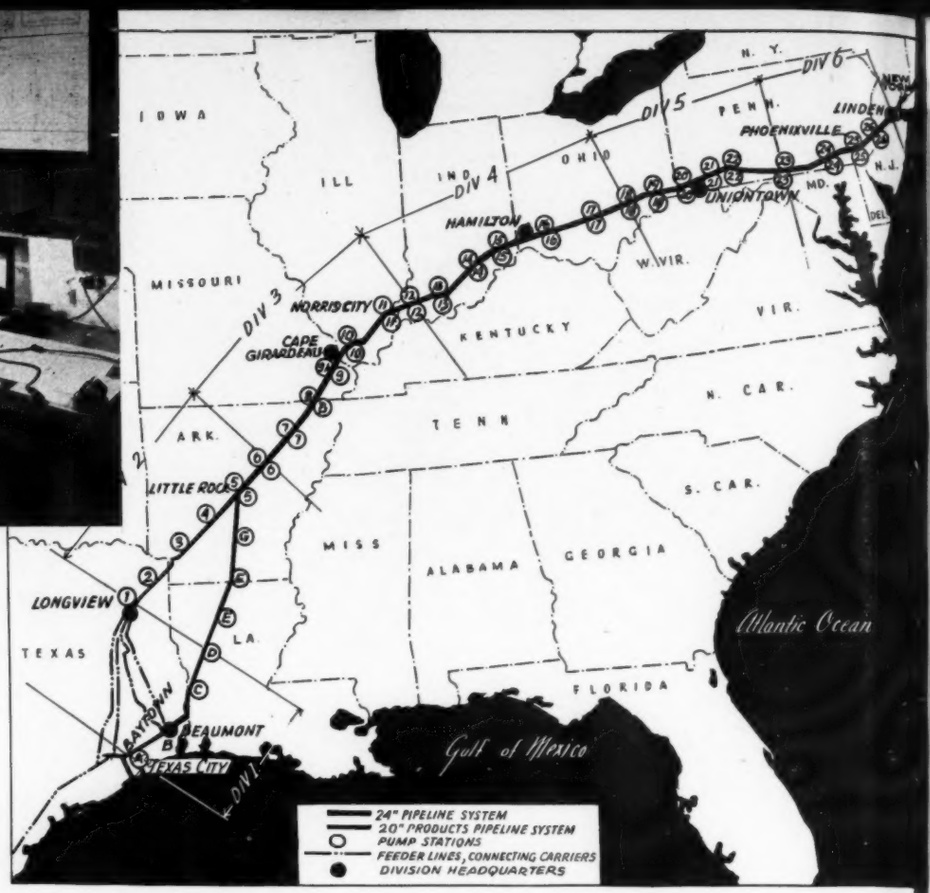


Plate 1—Route of Two Main Lines With Operating Divisions and Pump Stations.

neighborhood of a hundred and fifty million dollars starting as a complete operating unit, but that is just what happened when War Emergency Pipelines was put into operation. Although a considerable amount of improvising was necessary in the first few months of operation, literally within that time a smooth functioning and well knit organization was in being. How this was done at a time when a severe manpower shortage existed is quite a story in itself. Since it involved finding and hiring men for the various classifications of the organization, a canvass was made extending practically from coast to coast. War Emergency Pipelines now employs about 1500 people. A great many of the employees, excepting key personnel, had never seen a pipeline before. A functional organization chart (Plate 5) shows the staff which operates the systems.

The six operating divisions are so set up that each is a complete unit in itself for the continuance of the maintenance of operations. A division, with its headquarters point, is a complete operating staff. A superintendent, an assistant superintendent, a chief clerk and a warehouseman, and the necessary office personnel handle all matters in their respective divisions. The divisions have their own repair equipment, trucks, automobiles, tractors, tools and all the other necessary equipment for maintenance and operation. The division superintendent, with his assistant, is responsible for all operations within the division. The chief engineer at each station site, reports directly to the division superintendent. All matters in connection with the requisitioning of material, payrolls and similar affairs are handled from the division office. Each division has its own mechanical and electrical repair crews, as well as the regular pipeline maintenance gang.

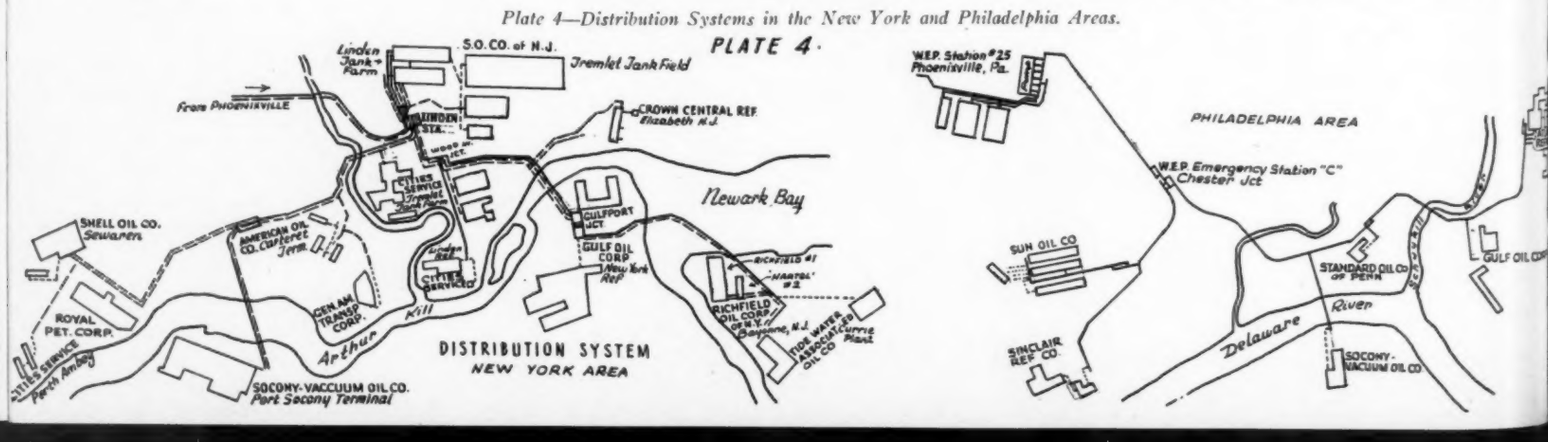
Dispatching, forecasting and batching operations are headed by an assistant general superintendent in charge of oil movements. The dispatching office is located in the general office in Cincinnati, Ohio. It operates through a chief dispatcher, with a tour dispatcher on each of the main lines and the products feeder system. A dispatcher's clerk times batch arrivals at intermediate stations and strikes an hourly balance of receipts against deliveries, corrected for temperature. Relay dispatchers are located at Baytown, Beaumont, Phoenixville and Linden for passing on dispatching orders to field operating personnel. The crude oil feeder system is dispatched by tour dispatchers at Longview who fit field gathering operations and schedules of supplying trunk lines into the requirements of the 24" main line.

The dispatching office has a complete private line telephone system for its use in directing pipeline activity. This service is direct from the dispatching office to each of the pump stations and to each of the division offices with an additional connection into the general superintendent's office. The private line telephone equipment consists in general of the following facilities. At each crude station a telephone hand set of the step to talk type has been placed in a booth adjoining the pump room.

When the station operator wants to talk with the dispatcher he steps on the foot pedal. At all other times this talking circuit is dead, thus keeping pump room noises from the circuit. A special loud speaker has been designed for the crude stations and is mounted on a steel plate sealed in the fire wall which separates the pump room from the motor room. The horn part is thus in the pump room and the electrical parts are in the non-hazardous area of the motor room. Explosion proof gongs which can be operated by dialing from the Cincinnati office are also part of the crude pump station set up.

At the pump station on the Little Big Inch (the products line) each station has a control room which is completely separated from both pump and motor room. This control room is maintained under fresh air pressure at all times to keep it free from dangerous fumes. In these products line control rooms standard loud speakers and hand sets with buttons which must be pushed to talk are used. Explosion proof gongs, located in the pump room, can also be operated by dialing from Cincinnati.

Plate 4—Distribution Systems in the New York and Philadelphia Areas.



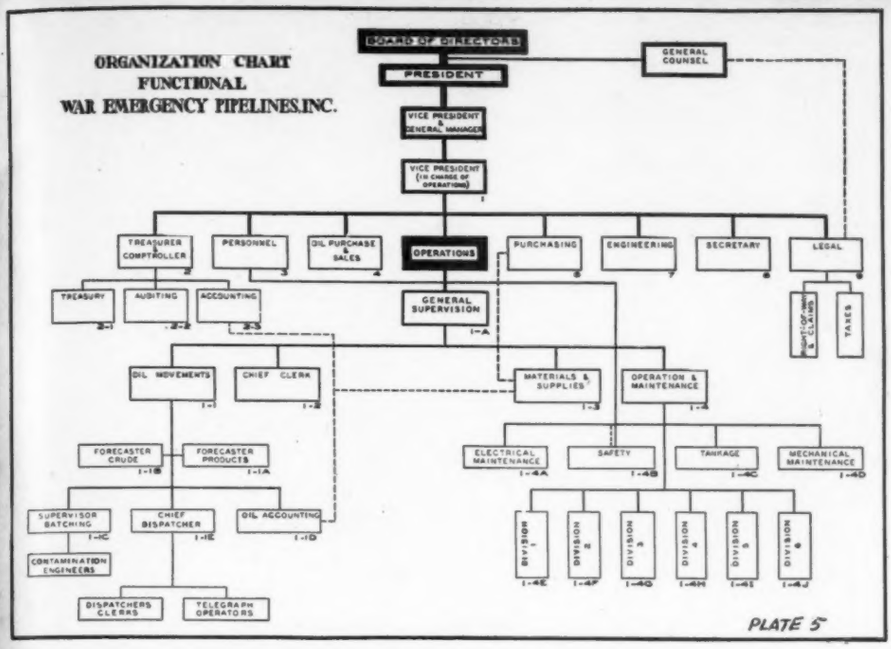


Plate 7—Telephone Equipment Used in Crude Pump Stations.

Communication facilities include a telegraph message circuit from the general office to all the division and district offices. With the aid of this telegraph circuit the private line telephone circuit is kept clear for the actual pipeline operation. Thus direct telephone service is maintained at all times and by means of the loud speakers every station is aware of all operating orders and adjustments. The regular function of the dispatching office is, of course, to receive the hourly operating reports of receipts and deliveries and line pressures. An emergency of any sort, whether caused by a power failure, or trouble with the pumps or motors at any of the stations requires immediate attention. It is then that the loud speakers are most valuable for every station hears of the interruption without being called in by the dispatcher.

It is up to the dispatching office, through the chief dispatcher, to regulate pressures and keep the proper number of pumps in operation at the various stations to produce the most efficient operation.

Plate 6 shows the dispatching office at Cincinnati. The man to the left of the photograph operates the products line, while the man on the right handles the crude line. Plate 7 shows the type of telephone equipment used in the crude pumping stations.

The planning of the operation of the two big pipelines is largely a matter of the supply and disposition of the materials pumped. The main lines, of course, can be speeded up and slowed down at will. For War Emergency and for that matter any trunk pipeline system, the most efficient operation takes place at the point where the lines run at their maximum capacity. In the particular case of War Emergency Pipelines, every barrel of oil that can be pumped is desperately needed, which is an added incentive to keep the lines at their maximum rate at all times.

In other pipelines, this is a matter of efficiency and consequently of earning power. In War Emergency Pipelines, it is an absolute necessity. The crude oil is gathered in three grades from eleven different suppliers and the entire amount of storage facilities at the Longview tank farm total only 1,260,000 barrels. Each grade of crude oil is later delivered, unchanged by its passage through and contact with the other crude oils in the pipeline to eight refiners in the New York-Philadelphia area.

On the products line the material is gathered from fifteen different suppliers into a total amount of storage of only 1,320,000 barrels at the Beaumont tank farm, through which station every barrel of product transported by Little Big Inch is pumped. It is later delivered in the New York Harbor area to fifteen delivery terminals. Not a single barrel of oil has ever had to be slopped for failure to meet specifications which are rigidly upheld by Navy inspectors.

Plate 9—Graphical Method Used for Planning Operation.

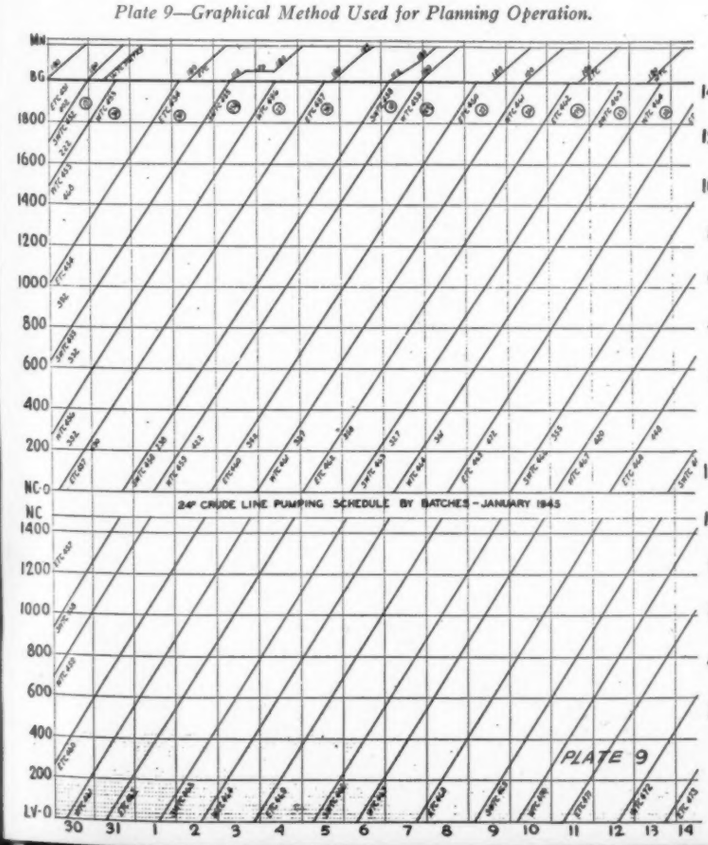
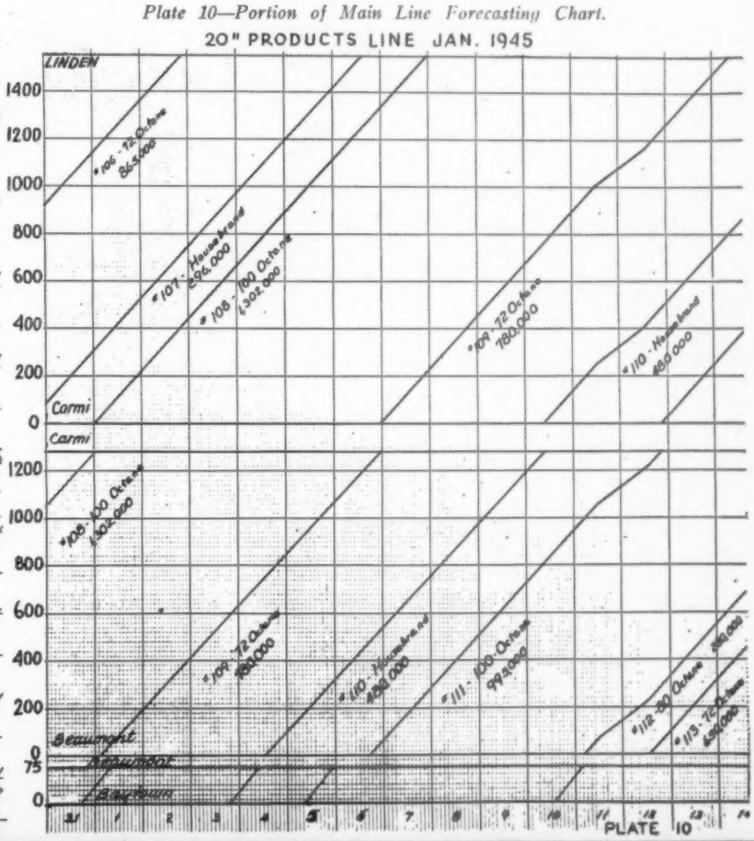
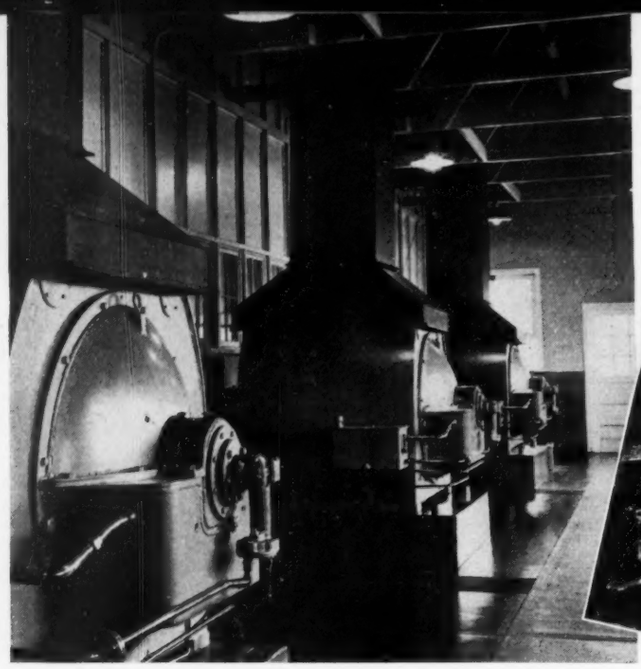
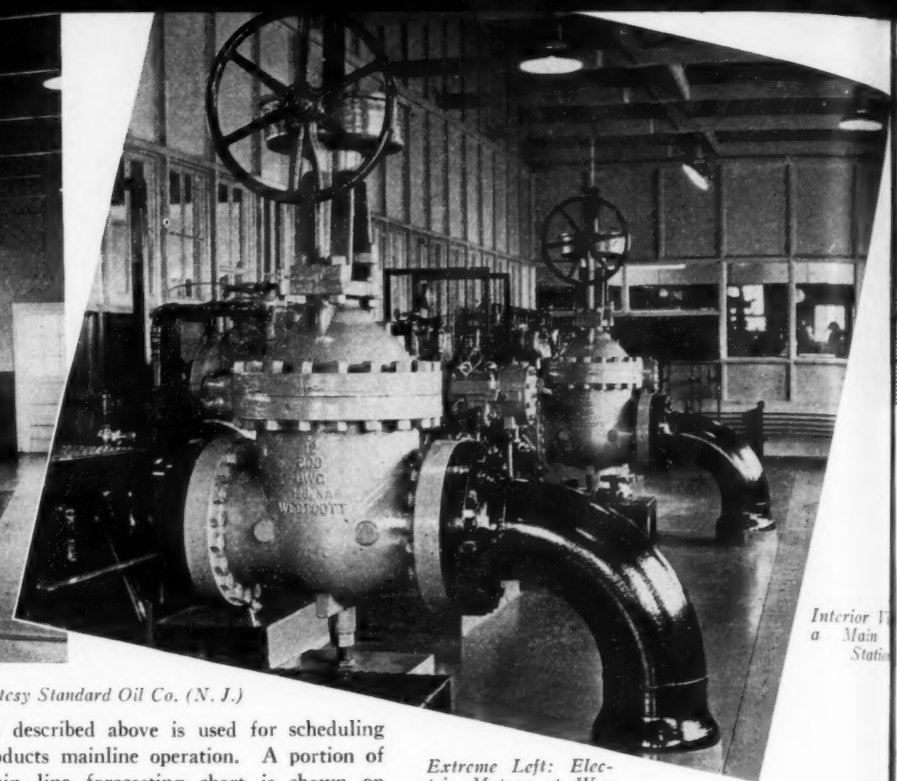


Plate 10—Portion of Main Line Forecasting Chart.







(Photos Courtesy Standard Oil Co. (N. J.)

Extreme Left: Electric Motors at War Emergency Pipeline Pump Station.

Interior V a Main Statio

In the case of the crude oil line, in actual practice the quantities to be received and the refiners to whom this crude oil is to be delivered are set by the office of Petroleum Administrator for War and the operation is planned for the main line about fifteen days in advance. Plate 9 shows the graphical method used for the planning of the operation. Only a section of the complete chart is shown. The days of the month are shown as abscissi, with the days split to show hours. The ordinates are contents of the pipeline in barrels to points along the pipeline. Obviously then, progress of a batch is indicated by the slope of the line on this chart and with the aid of this graphical method, arrival times for the various batches at key points on the line may be forecast with considerably accuracy.

Purchases for supplying the 20″ products line are also set up by Petroleum Administration for War, designating the amount by grades to be received from each of the fifteen supplying refineries on the Gulf Coast. The allocations of the various crude oils and products having been made, the actual consummation of the acquisition of these allocations is made by our oil purchasing division issuing purchase orders to each supplier involved for quantities as designated by Petroleum Administration for War. After the issuance of such purchase orders, the problem of the transportation of the oil passes as a responsibility of the assistant general superintendent in charge of oil movements.

Deliveries for Army and Navy, or the industry, are likewise determined by PAW. The graphical method described above is used for scheduling the products mainline operation. A portion of the main line forecasting chart is shown on Plate 10.

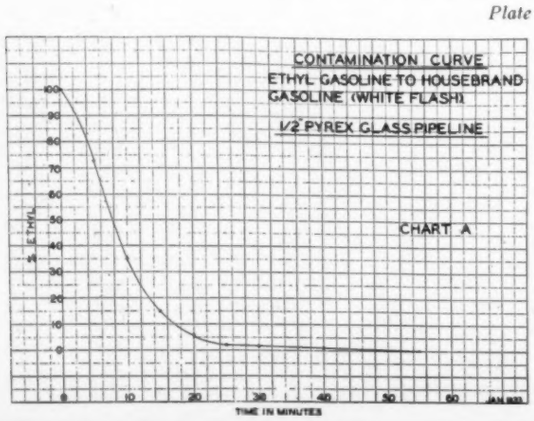
The same method is given further application for scheduling receipts from supplying companies in order to use pipeline storage to the best advantage. This graphical method of representation was first developed by Keystone engineers in the operation of their Keystone-Buffalo system.

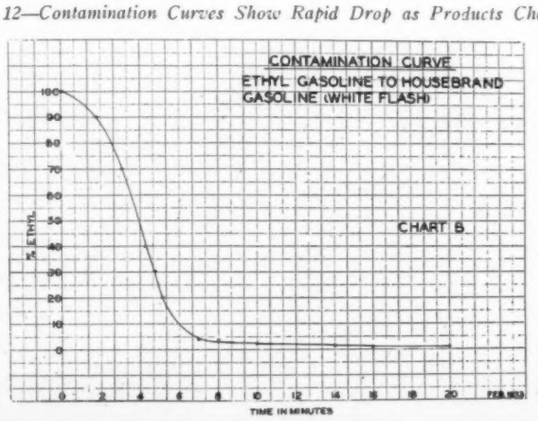
Probably the subject which more people have asked questions about is, "How can so many products be pumped through the same line without being contaminated?'. While this operation, the pumping of many products through the 20″ line, is without doubt the largest of its kind, it was by no means the first. The principles which make possible the batching of various oils through the same system were developed as early as 1932. In that year, by virtue of a study made on a half inch glass replica of their products pipeline, Keystone Pipe Line Company engineers were able to predict the results of batching different oils in their trunk line and products line distribution system.

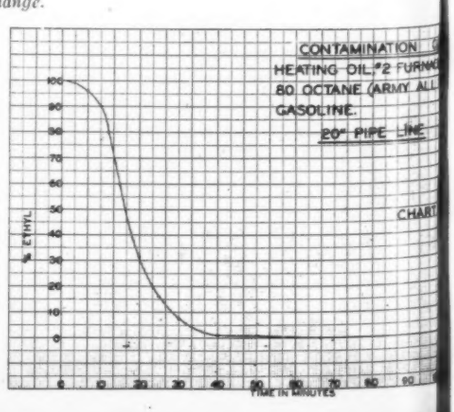
It was determined that by exercising certain controls it was possible to successfully handle products of widely varying specifications through the same pipelines. They found that the controlling factors were due to the fact that liquids have a tendency to adhere to the metal pipe surface as they are flowing through a pipeline. Because of this tendency, the outermost cylinder of liquid in a pipeline moves slowly and each succeeding cylinder may be regarded as sliding over its neighbor like an unfolding telescope. The velocity with which each cylinder moves through the pipe increases from the wall towards the center. It has been proven that these factors are a function of the Reynolds' Number for the particular product being pumped in a particular pipeline. On this basis it was possible to predict the characteristics of the mixture at the interface between the two liquids even for the exaggerated conditions of a 1200 mile movement through a 20″ pipeline.

The similarity of the characteristics of the mixed section in the half inch glass line, the 8″ trunk line and the 20″ product line is shown by Plate 12. At Beaumont we start with one minute and fifty seconds of mixture resulting from the timing of motor operated suction gates. As this new batch proceeds up the line, at each of the twenty-seven main line products stations it is necessary to switch the centrifugal pump leak-off to the sump tank for the particular grade being pumped. In this connection it might be noted that all the pump station manifold piping has been so arranged that it is practically self-flushing so that the danger from contamination in the manifold has been reduced to a minimum.

Plate 12—Contamination Curves Show Rapid Drop as Products Change.







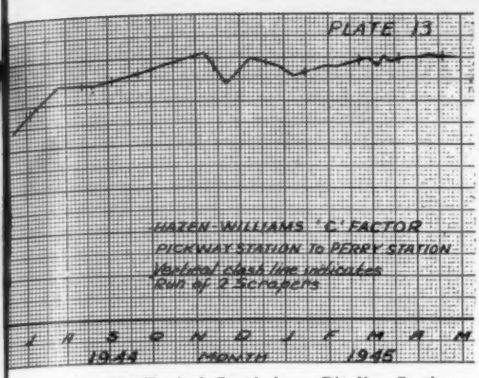


PLATE 13
HAZEN WILLIAMS 'C' FACTOR
PICKWAY STATION to PERRY STATION
Vertical cross line indicates run of 2 Scrapers
J A S O N D J F M A M
1944 MONTH 1945

Plate 13—Typical Graph for a Pipeline Section of Approximately Fifty Miles.

On arrival of a new batch at Linden station, flow is continued direct to consignees through the distribution lines shown on Plate 4. Contamination engineers, sampling at appropriate locations, switch the receiving tanks from one grade to another as the distribution lines are displaced by the main line stream. The cut is made direct from one product to another at each receiver's plant without the use of slop tanks. By studying the interface characteristics the cut is made so that the quantity of each grade introduced into the pipeline at Beaumont is accounted for by grade upon delivery at destination, without loss to higher grades through degradation.

In War Emergency Pipelines, it was deemed advisable to set up a corrosion control group, functioning under the chief electrical engineer. The work of these engineers was divided into two classes; control of corrosion on the inside of the pipe and the corrosion which takes place on the outside, commonly known as electrolysis and soil corrosion.

A very serious problem present in product pipelines is the damage which is caused by corrosion on the interior surface of the pipeline. The resulting products of corrosion produce two extremely undesirable results.

(1) They decrease the efficiency of the pipeline by increasing the roughness factor and thereby reducing the pipeline thruput.
(2) The other effect of internal corrosion is to contaminate the material pumped with very fine, roughlike particles of iron oxide. Even in gasoline and furnace oils for civilian use this is a very undesirable conditon. In the products made specifically for the military, such as 100-octane gasoline, 80-octane all purpose gasoline and 702 Diesel oil, it cannot be tolerated.

Since every barrel of refined product is so desperately needed by the fighting forces and since all of it must be free of foreign materials, considerable thought was given to methods for combating this internal corrosion phenomena.

The dangers from the effects of internal corrosion were clearly understood by War Emergency management before the 20" products line was put in use. All the water with which the pipeline was hydraulically tested prior to its being put in service was treated to prevent rusting during the testing operation. As soon as possible after the line had been put in operation, control was exercised by the addition of a chromate inhibitor to the materials pumped through the line. The control method used was that developed by The Atlantic Refining Company for their Keystone-Buffalo system.

The inhibiting material (sodium chromate) is injected into the pipeline at four main line stations (one other injection point protects the Baytown-Beaumont line) which were determined experimentally. The results of this internal corrosion can be shown clearly by the effect on the Hazen and Williams "C" factor. A continuous record of the roughness of the inside of the pipe is maintained by keeping a running record of the Hazen and Williams "C" factor for each section of the pipeline. A typical graph for a pipeline section of approximately fifty miles is shown as Plate 13. It can be seen that the Hazen and Williams "C" factors are being maintained in the neighborhood of 160 and that there has been a gradual improvement from a low point of 144.

A pair of scrapers, or pigs as they are sometimes called, are run through the pipeline once in each thirty day period. The reason for running scrapers once each month is mainly to clear the line of any excess water which may have dropped out of the products being pumped due to the lowered temperature of the products as they progress northward and eastward. This avoids the possibility that hazy oils might be delivered in the New York area. Also the practice seemed sensible in order to put the inside of the line in first class condition as quickly as possible after operations had begun.

As a further check on the effect of the inhibitor, the total amount of iron oxide carried by the scrapers is measured quantitatively. This is done to indicate any change in the rate of rusting which might not be picked up in the analysis of the "C" factor values until the rusting had progressed to a point where it would have a deleterious effect on the product pumped. This check on the progress of the rusting is obtained by analyzing the material which is brought in with the scrapers. Samples of the pipline stream are collected during the running of scrapers. These samples embrace a period of time for about an hour before the scraper is due until the stream has completely cleared and shows no signs of moisture nor foreign particles. Given quantities of these samples are then passed through a Gooch crucible and the residue is then analyzed for iron oxide content. The effect of the inhibitor on the total amount of oxide removed from the pipeline is shown clearly on Plate 14. The upright bars indicate the total quantity of rust removed in the New York Harbor area. Production of this iron oxide in the interior of the pipeline has been reduced to a minimum.

Inhibitor injection was started about the middle of August, 1944. It would appear from the chart that more rust was taken out in the month of August than has been taken out in the entire remaining interval since the introduction of the inhibitor.

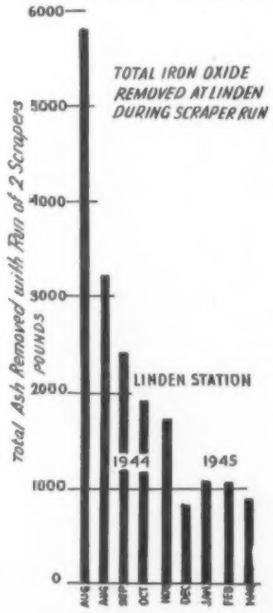
Another enemy of continuous pipeline operation is the danger of damage to the pipe by electrolysis and soil corrosion. Pipeline leaks, with the resulting loss of oil and shut down time for location and repair of the leaks, is a real menace to continued high thruputs. Especially serious is the threat of severe electrolysis trouble in the congested New York and Philadelphia areas where numerous trolley lines and large underground networks are to be found. Another source of trouble from stray current electrolysis is found in the areas where the pipeline crosses underground mining operations.

War Emergency Pipelines maintain two complete electrolysis crews with the finest type of electrical and chemical equipment for the location and elimination of corrosion trouble spots. The equipment includes in addition to the usual number of voltmeters and millivoltmeters (both recording and indicating) copper sulphate electrodes, ground testers, ph meters and two complete radio transmission and receiving sets. These radio trans-ceivers are used in the analysis of complicated electrical network problems, several of which have been encountered in the eastern area.

Other work done by the corrosion crews includes the location of "hot spots" due to so-called local action, as well as the effects of long line currents. Much work already has gone forward along these lines so that today a considerable section of War Emergency Pipelines is under cathodic protection.

By fitting the above plan of operations into a coordinated organization the load factor of thruput of both War Emergency Pipeline systems has been maintained at a peak, resulting in the movement of 226,708,152 barrels of crude oil and 3,662,131,662 gallons of products to May 1, 1945, the greater part of which has gone direct to our fighting forces.

Plate 14—Effect of Inhibitor on Oxide Removal.



Big Ditches Prepared Pipe Line Bed at Four to Six Miles Per Day.

Maj. A. N. Horne

Upper Right: Clearing the Way for the "Big Inch."

EMERGENCY PIPELINES – THEIR RECORD IN REVIEW

By Major A. N. Horne

Delivery of Over 300 Million Barrels to Atlantic Seaboard Has Justified Construction of Big and Little Inch as Vital Factor in Winning of the War.

AS early as 1940 it was pointed out that transportation facilities for the movement of oil from the southwest to the Atlantic Coast would be inadequate in a national emergency. This was indicated in a report to the President by the Secretary of the Interior acting as Petroleum Coordinator. At that time the construction of a large diameter crude oil line from Texas to the Atlantic seaboard was suggested.

This threat became serious when a number of American tankers were transferred to the British in April, 1941. Early in the following month, a group of major oil companies recommended a 24-inch crude line of 250,000 barrels per day capacity from Texas to the East Coast, and also began study of a refined products line.

A National Emergency was declared on May 27, 1941.

In June plans for a 24-inch crude line from Longview, Texas, via Salem, Illinois, to the Eastern Seaboard definitely got under way; routes were surveyed, and allocation of steel was sought and denied in July. Preliminary work was kept going and by September, aerial surveys, and general plans and specifications were completed by eleven major oil companies. These companies proposed to privately finance and build the 24-inch crude line. They also studied routes and made estimates for a large diameter refined products line. A second refusal to allocate steel in October 1941, put an end to this particular proposal but did not kill the idea.

After Pearl Harbor, the eastern petroleum supply situation became acute; it was made critical by heavy losses of tankers due to enemy action.

Early in 1942, the pipeline project was revived, along with measures for additional tanker construction and a stepping-up of railroad shipments to maximum capacity, while rationing reduced civilian consumption.

On June 10, 1942, after numerous conferences between representatives of the oil industry, Congressional committees, several governmental agencies, and the Army and Navy, it was agreed that a 24-inch crude line should be built from Longview, Texas toward the Philadelphia-New York area as rapidly as steel could be made available, and that a 20-inch products line should also be constructed from the Texas-Gulf Coast to the same area, when and as allocation of steel could be made.

Only 137,500 tons of steel could be made available for the remainder of the year. It was determined to lay this steel as far as it would go, to erect a loading terminal and start rail shipments of crude, via the shorter haul. The steel tonnage available was estimated sufficient to build a line from Longview, Texas, to Norris City, Illinois, a distance of 530 miles.

The program adopted called for Reconstruction Finance Corporation to provide the $35,000,000 estimated cost of the first section, through Defense Plant Corporation, as owner, with the Office of Petroleum Coordinator as sponsor.

Eleven major oil companies, sponsors of the original proposal, organized War Emergency Pipelines, Inc. with a charter stipulating that no dividends or profit might accrue, directly or indirectly, to the corporation's stockholders, by reason of the performance of government contracts. This corporation entered into an agreement with Defense Plant Corporation to supply without cost all plans and aerial surveys heretofore completed at industry expense, and to furnish experienced personnel to build and operate the project.

The objective was completion of the 530 miles of pipe lines, with necessary tankage, pumping stations, and loading terminal by January 1, 1943.

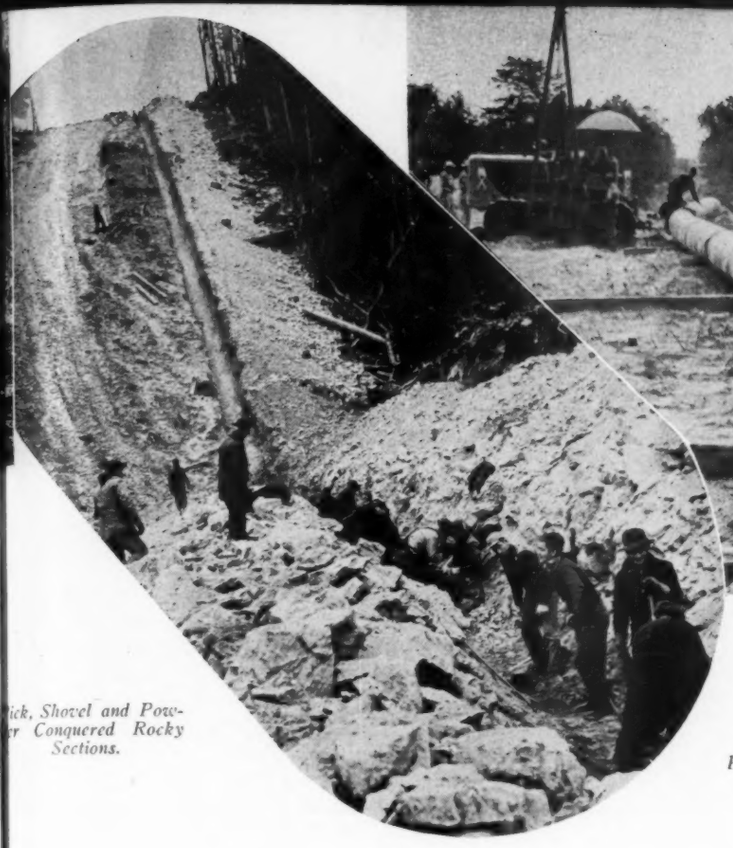
On June 23, ground survey was started, and soon fifteen parties were engaged in staking the route.

Organization and personnel of War Emergency Pipelines, Inc. and contractual arrangements with Defense Plant Corporation were completed by July 1.

Purchase order for pipe was placed on July 2, first pipe was produced at the mill on July 9, and the first trainload shipped on July 18.

Construction offices were opened at Little Rock, on July 3, and arrangements started for unloading pipe at yards along the general route of the line. Pipe was to be shipped at the rate of five miles per day.

This being the largest diameter oil pipeline ever constructed, and of heaviest pipe (3/8-inch wall thickness, 94.6# per foot, about two tons per joint), qualified contractors known



ick, Shovel and Pow-r Conquered Rocky Sections.

Making a "Cold Bend" in the Field.

Pipe Ready for Submersion at a River Crossing.

to have experience and heavy equipment, were called into conference on July 11.

Eight construction sections, ranging from 30 to 60 miles in length, were established, as well as a system of feeder lines at Longview, and delivery lines at Norris City, and contractors and equipment were assigned to each.

On July 15, cost-plus-fixed-fee contracts were signed in Washington, and contractors were instructed to move in immediately and work every hour of daylight possible until completion.

The first pipe was laid on August 3, and very shortly thereafter all construction crews were organized and laying pipe up to as much as nine miles per day.

In the meantime, detailed plans and specifications for the pumping stations, tankage, and loading terminals were being rushed, and orders placed for motors, pumps, valves, fittings, transformers, switch gear, steel tankage, railroad trackage for loading terminals and the multitudes of other miscellaneous materials and supplies, all of which had to have priority ratings along with other billions of dollars worth of vital war equipment.

Since the eleven pumping stations were powered by electric motors it was necessary to rush survey for power supply, negotiate contracts for 50,000 H.P. of electrical energy, and push transmission line construction.

Construction of 31 steel storage tanks at Longview and Norris City, from old tankage that had to be cut down, shipped and re-erected was no small part of the project.

The loading terminal at Norris City consisted of over a mile of loading racks with seven miles of railway tracks to serve.

Pumping station construction was badly delayed because of difficulty in securing delivery on equipment. Practically every item was on the critical list.

Each main line station consisted of three single-stage centrifugal pumps, each direct-connected to a 1500 H.P. 1800 RMP electric motor. The pumps and motors were special design and overall dimensions were interchangeable. Because cast steel was extremely critical, gate valves were built of cast iron and weighed eight tons each. Production was limited and delivery slow. Likewise, fittings, flanges and other parts were difficult to procure.

Weather was favorable for construction work until November, and the terrain was good, except for certain swampy areas in Arkansas, Missouri and southern Illinois, where as much as 15 miles in a stretch had to be corduroyed and pipe carried in a joint at a time by tractors. Outcropping granite in one area required blasting for the ditch for about nine miles.

Every construction crew worked every daylight hour possible, and all were handicapped by shortages of labor and difficulties in securing repair parts for equipment, trucks and cars. Ditching machines operated on a 24-hour basis, and much repair work had to be done at night.

Protective coating of the pipe against corrosion was facilitated by ingenious machines which cleaned rust and dirt from the pipe, and at the same time applied a primer coat of paint. Another machine followed, which applied a coat of heated coal tar enamel, and simultaneously applied a spiral wrap of asbestos felt. This finished protective coating required very careful handling when the pipe was lowered into the ditch.

River and major creek crossings were a special problem. This work was done on separate contracts by experienced specialists. The usual procedure was to excavate each bank of the stream to a depth below stream bed and as far back from the bank as necessary, so that bank cutting would not uncover the pipe. A channel across the stream was opened to proper depth below stream bed by dredging, or by blasting. The pipe, after being welded into short sections, coated and wrapped, and river clamps or weights added, was then pulled across by cables, as a new section was added. Across streams, such as the Mississippi, the pipe had to be laid from barges.

When the Arkansas River crossing was all but complete, a flash flood broke all the cables and lines, and swung the end of the line down stream, collapsing it at a point near the center of

One of 200,000 Welds on the Big Line.

Winter Storms Did not Halt Progress.

the stream. When the flood subsided, the pipe was pulled out, cut into sections, then reinstalled.

When the Mississippi River crossing lacked only two days of completion a sudden flood broke barge lines, and caused the pipe to drop. It was necessary to pull out all the pipe, and reinstall. This occured on December 29, just about the time when fluid was started into the completed line at the south end. No delay was experienced, however, when the stream reached the point at which the break had occured.

Pumping station sites were not obtained until November 1. Construction of stations had to be pushed with all possible speed, but on December 31, only three of the huge main-line gate valves had been received, and by much shifting of material and substitute arrangements, alternate pumping stations were made ready for filling the line.

Concurrently with main line and station construction, tankage and some 220 miles of feeder lines in the Longview area were made ready for receiving oil from the several sources of supply at other pipe line stations and line junctions.

Heavy general rains and cold weather the first week in December made progress extremely difficult. Almost superhuman effort was required to complete the last few miles.

At twenty minutes before midnight December 31, 1942, the first crude oil was started into the line at Longview station, meeting the completion date set for January 1, 1943 with these few minutes to spare.

Ahead of this stream of oil was a slug of about fifty miles of water, to be used for pressure testing. This was a hazardous procedure because of the possibility of freezing. Fortunately, there were no defects in the pipe or field construction, and sufficient gate valves were obtained to permit continuous pumping with a few stations and makeshift arrangements.

First oil arrived at Norris City, February 13, 1943, and the first trainload of oil moved eastward on February 19.

On October 26, before completion of the first section of Big Inch, allocation of steel was made for extending the line on to the East Coast, at an estimated cost of $60,000,000 with the scheduled completion date, July 1, 1943.

Survey parties were placed on the route at once and construction plans were made dividing the 722 miles of 24-inch and 110 miles of 20-inch branch lines into 18 construction sections, ranging up to 65 miles in length. The line was 24-inch in diameter to a point near Phoenixville, Pennsylvania, where it branched with a 20-inch line to Philadelphia and New York areas.

As rapidly as each construction section of the first section was completed, the contractor equipment and personnel were moved to assignment on the extension. Several contractors organized additional crews and were assigned additional construction sections, and several additional contractors were employed.

It was realized that winter construction, especially in the West Virginia and Pennsylvania mountains, would be extremely difficult. Yet the urgency was so great that the hazards were taken, resulting in 235 of the 910 miles being completed by the end of March 1943.

Pumping station sites were selected and acquired as rapidly as possible. Pumps, motors, transformers, valves and fittings were placed on order for best delivery obtainable, and additional tankage was acquired for erection at Phoenixville Junction. Tankage at Linden, New Jersey was acquired in place. The very complicated Philadelphia areas were surveyed and construction began.

Again, river and stream crossings were a major problem, but fortunately a sufficient amount of equipment and experienced personnel were found. The Ohio River and most of the other streams presented no major difficulties. The Susquehanna and the Delaware river beds were almost solid rock and required many tons of explosives for blasting a trench for the pipe. One branch of the distribution system had a three mile underwater stretch across Newark Bay.

The route of the line was directly across each mountain chain in Pennsylvania and this was the most hazardous part of the construction. Many good machines rolled down the mountainsides to total wreckage, and accidents to personnel were unavoidable.

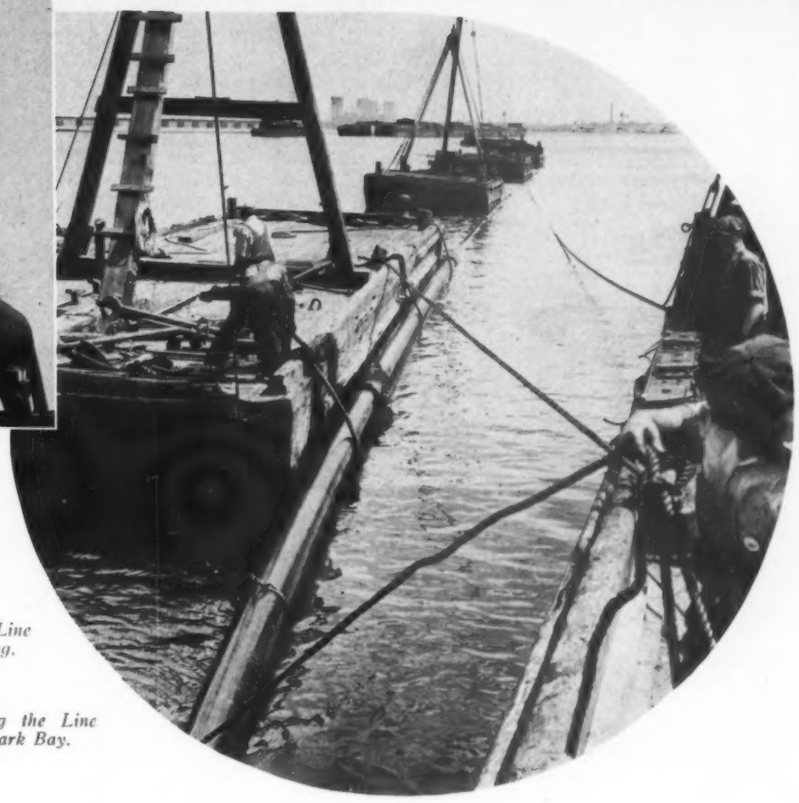
In January 1943, it was necessary to move construction headquarters from Little Rock to Cincinnati, in order to be near the center of operations and construction. This caused some interruptions and delays to the huge volume of paper work required under the type of contracts and governmental regulations.

In the meantime, operations on the first section of line were brought up to maximum as rapidly as equipment and material for completion of pumping stations was delivered, and personnel was being rapidly trained to high efficiency.

Tank car loading at Norris City reached a peak of 1250 cars per day. Sixteen to eighteen trains per day moved out to the East Coast on the fastest schedules possible.

At the same time, up to 40,000 barrels of oil per day was being delivered to a connecting carrier at Enfield, Illinois, for car loading or moving through other pipe line systems to the east.

On May 17, 1943, an unprecedented flood on the Arkansas River at Little Rock took away several hundred feet of the north bank and broke the pipe line. This was remedied by laying seven miles of 20-inch bypass line upstream,



Inspecting the Line After Welding.

Barges Guiding the Line Across Newark Bay.

through city streets, to and across a railroad bridge, then back down stream on the north side in the record time of 165 hours.

When the flood subsided, the broken line was replaced, and dredged to depth many feet below stream bed and for a distance of nearly a mile, including stream and alluvial land that at some future date might be further eroded by flood waters.

During the same flood period, the Mississippi River went to new high flood levels. A reserve 24-inch crossing was under construction, and nearly completed, when a tow of barges became unmanageable, struck the pipe-laying flotilla, breaking anchor and mooring lines, and dropping the suspended pipe. It was necessary to pull and replace this crossing.

A levee broke and inundated station No. 9-B, near Gale, Illinois for a period of 39 days. This was a 2-unit station, and was located on the east bank of the river at one third the distance east of the regular location, because of lack of sufficient power at the regular station location, where one pumping unit was installed.

Approximately one year later the levee again broke, but station equipment was removed before inundation to the regular location west of the river where power was available after construction of a transmission line to serve the products line station.

On January 26, 1944, when the 24-inch crude line extension was barely under way, allocation of 173,750 tons of steel was made for a 20-inch 5/16" wall thickness, refined products pipe line, having 235,000 barrels daily capacity of gasoline from Beaumont, Texas, to Seymour, Indiana, with a car loading terminal at that point (ultimate goal, New York Harbor area). The estimated cost of the project was $44,000,000 with completion date scheduled for September 1, 1943. The project was to include 62 miles of 16-inch line to Baytown, Texas area, with smaller lines to the several refineries in the Beaumont-Port Arthur-Houston refining area.

This new project called for immediate increase in key personnel for survey, design procurement of materials, and construction.

Final route selected as most practical was Beaumont to Little Rock, Arkansas, thence north and east on the right of way of the 24-inch crude line to Seymour, a distance of 824 miles.

Survey parties and right of way procurement men were immediately put to work south of Little Rock. Additional contractors and equipment were obtained, and the job was laid out in 12 construction sections ranging from 60 to 276 miles, including the feeder lines.

In the meantime, before 20-inch pipe began to arrive, approval was given for the additional 639 miles to complete the system all the way to Linden, New Jersey, a total distance of 1475 miles. The total project now amounted to 1633 miles of main line with several sizes of smaller pipe in the feeder and distribution lines. Later on 52 miles of 8-inch line from Beaumont to Lake Charles, La. were added.

Soon tied-up on these two jobs were just about all the heavy pipe line construction equipment and experienced contractors in the country.

In June, 19 contractors with 29 complete construction crews were working from dawn to dusk on line construction, while 16 crews were engaged on pumping stations and special crews were busy on the 65 major stream crossings.

The following tabulates construction mileage for the year 1943:

Month	Crude-Oil-Line Extension	Products System	Total
January	20	---	20
February	49	---	49
March	166	---	166
April	190	3	193
May	164	78	242
June	223	224	447
July	83	333	416
August	10	396	406
September	5	308	313
October	---	171	171
November	---	120	120
December	---	8	8
Total	910	1,641	2,551

Note the small completed milage for the first five months of the year. This was due to extreme winter conditions for the first three months and almost continuous rains during April and May.

The record completion for one day on the 20-inch line was 19.91 miles, while the individual crew completion for one day was 4.09 miles.

At Baytown, twelve 55,000 barrel steel tanks had been obtained, and crews were busy cutting down, shipping and re-erecting. At Beaumont, twenty 55,000 barrel tanks were secured at the station site, and were being reconditioned.

Each pumping station (29 total) for the products line, like the crude line, was equipped with three single-stage centrifugal pumps, in series, each direct-connected to 1250 H.P.,

3600 RPM electric motors. South of Little Rock stations were spaced 50 to 60 miles. Beginning at Little Rock, each crude and products station was located on the same site, but in separate buildings.

The first crude oil was turned into the 24-inch extension at Norris City on July 14, 1943, the last main line weld was completed August 14, and first oil arrived at Phoenixville August 14. The total elapsed time for construction was 350 days. It was several months later before all material arrived to complete all pumping stations and realize full line capacity.

Construction progress on the 20-inch line was rapid, and on October 28, 1943, water for testing was started into the line at Beaumont. The final weld was made on December 2, 1943. From the beginning of construction to the date of the final weld the total elapsed time was 225 days.

The testing period was prolonged because of some defective pipe, and was very difficult and hazardous because of bitterly cold weather. However, on January 26, 1944, the first refined product was started into the line at Beaumont, with only alternate stations ready for pumping, and most of these with makeshift arrangements and substitute equipment.

Since all sections of the line were completed almost simultaneously, it was not necessary to erect a car loading terminal at Seymour, as originally planned, nor to use the existing terminal at Norris City, except for a few trainloads of heating oil.

SOME FACTUAL DATA

Big Inch

Length of Main Line (24" diameter)	1,254 Miles
Feeder and Distribution Lines	222 Miles
Total Length of Pipe in System	1,476 Miles
Weight of Pipe in System	358,000 Tons
Weight of Steel Plate in Storage Tanks	20,700 Tons
Number of Pump Stations, including Terminals	28
Number of Main and Branch Line Pumping Units	81
Number of Auxiliary Pumping Units	19
Electric Motors, Total Rated Horsepower	130,000
Daily Power Consumption at Full Load	2,040,000 Kilowatt Hours
Number of Oil Tanks in System.	51
Capacity of Oil Tanks	3,955,000 Barrels
Number of Main Line Gate Valves (24" and 20")	150
Number of Pump Station and Service Line Valves, (12 inches in diameter and larger)	995
Number of Check Valves (12 inch and larger)	161
Total Number of Valves (12 inch to 24 inch)	1,306
Volume of Oil Required to Fill Pipe in System	3,836,000 Barrels or 161,112,000 Gallons
Daily Throughput of "Big Inch"—Full Load	300,000 Barrels or 12,600,000 Gallons
Annual Throughput of "Big Inch"—Full Load	109,500,000 Barrels

Little Big Inch

Length of Main Line—(20" diameter)	1,475 Miles
Feeder and Distribution Lines	231 Miles
Total Length of Pipe in System	1,706 Miles
Weight of Pipe in System	287,000 Tons
Weight of Steel Plate in Storage Tanks	14,800 Tons
Number of Pump Stations, Including Terminals	31
Number of Main and Branch Line Pumping Units	86
Number of Auxiliary Pumping Units	8
Electric Motors, Total Rated Horsepower	120,000
Daily Power Consumption at Full Load	1,885,000 Kilowatt Hours
Number of Oil Tanks in System	47
Capacity of Oil Tanks	2,860,000 Barrels
Number of Main Line Gate Valves (20 inch)	184
Number of Pump Station and Service Line Valves (12 inches and larger)	610
Number of Check Valves (12 inches and larger)	152
Total Number of Valves (12 inch to 20 inch)	946
Volume of Oil Required to Fill Pipe in System	2,870,000 Barrels or 120,540,000 Gallons
Daily Throughput of "Little Big Inch", Full Load as designed	*235,000 Barrels or 9,870,000 Gallons
Annual Throughput of "Little Big Inch", Full Load as designed	85,775,000 Barrels

*Gasoline

In general the construction methods used in laying both lines were the same as customarily employed in the industry. On both lines, all field joints were electric welded, with shield-arc rods, applied in three to four beads. In the more level country, conventional roll-weld, or firing line method was used, while in rough and mountainous country, stove-piping or single-joint procedure was followed. Some contractors used the stove-pipe method throughout.

Bending of the 24-inch pipe to fit the contours of the ground was done cold, on long sections, while the single joint method of laying required that the pipe be heated. For the 24-inch extension, factory bends of one to five degrees were available, which was particularly advantageous in hilly and mountainous sections. By the time construction of the 20-inch line began, a very efficient pipe bending machine had been developed, which resulted in saving many thousands of dollars, and a very considerable amount of time.

Both lines were given a continuous protective coating from the south end to a point in eastern Ohio, where the hilly country began. The remainder was coated only at suspected hot spots,

President Jones (Center) and Secretary Ickes (Right) View the Final Weld at Phoenixville.

Applying Protective Wrapping to the Big Pipe.

to the east coast area, where continuous coating was used.

At the peak of the construction period, the value of construction equipment employed was some $10,800,000, including 2100 trucks and automobiles.

The total number of persons engaged on the projects at any one time was over 16,000 and the largest weekly payroll amounted to over $1,000,000.

For the two projects 301 formal construction contracts and subcontracts were completed. Individual right of way grants totaled 7,500 and over 10,000 owner claims and 2100 tenant claims for damages have been handled. Condemnation proceedings were filed in 430 cases. Permits were procured for crossing railroads at 289 points, improved highways at 626 points, and major stream crossings at 80 places.

For communications necessary for administration and dispatching, a leased teletype system was installed but this was entirely inadequate. As soon as critical materials could be made available this system was replaced by a two-way voice system, with loud speakers and microphones at each division office, pumping station, and chief dispatcher's office. This method of communication results in almost instantaneous control of all pumping stations, individually or as a whole. Each station also has a long distance connection in addition.

The 24-inch crude line, or Big Inch, started operation with East Texas crude, supplied by a feeder system of lines connecting with the pipe line companies operating in the area. Soon, West Texas-New Mexico, and Southwest Texas grades were being moved to Longview through existing pipe line networks, with reversed flow, and supplemented by coastal tanker and barge movements.

The line has thus been slugging or batching three distinctly separate grades of crude oil. The size of batches has ranged from 250,000 to 500,000 barrels, and the amount of mixture has been surprisingly small for a large diameter line. Although this line has a nominal design capacity of 300,000 barrels of crude oil per day, it averaged better than 313,000 barrels per day during the year 1944.

The maximum thruput is limited, of course, by the heaviest or most viscous grade of crude, which is West Texas-New Mexico. Maximum summer thruput is approximately 5,000 barrels per day higher than for the coldest winter months.

Following are actual daily averages since line was fully loaded and balanced.

Past 11 months	317,400
June 1944-October 1944 (5 mo.)	319,300
Nov. 1944-April 1945 (6 mo.)	316,200

The peak day was -------- 334,507 barrels.

From the beginning of operations, the total volume handled through April 30, 1945 was in net barrels;

Deliveries	Norris City and Enfield	Philadelphia	New York
East Texas Crude	37,744,659,40	47,787,161,73	28,184,001,66
Southwest Texas	1,005,722,26	32,052,707,63	4,800,061,05
West Texas	7,354,453,93	20,629,262,02	43,212,857,19
Totals	46,104,835,59	100,469,131,38	76,196,919,90

Total Deliveries—all grades ---------- 222,770,886,87

It has not been necessary to run scrapers through the crude line either because of paraffin accumulation or internal corrosion from the sour crude. The West Texas-New Mexico crude dissolves the paraffin deposited by the other two grades, and as long as rate of flow is above turbulence, no moisture drops out to cause corrosion.

At full capacity, the velocity of the oil is about five miles per hour, requiring about 12 days for a barrel of oil to move the entire length of the line.

This volume of oil is equivalent to 21 trains of 75 cars daily, or an average of better than three pre-war tankers loading out every day. Rail movement of this volume would require a pool of more than 21,000 tank cars and around 250 locomotives wholly in this service.

The 20-inch products line, or Little Big Inch, has handled six grades of refined products (5 at one time), in batches ranging from 250,000 to 1,300,000 barrels in size, from the Texas Gulf Coast area, with a remarkably small amount of mixture or contamination of grades. The operations are such as to result in no "slop" to be re-run, and no unsalable product.

For a number of months, the line capacity has been devoted almost wholly to aviation gasoline and military fuels.

The design capacity of the line was 190,000 barrels per day, heating oil, or 235,000 barrels per day gasoline.

Here again, actual capacity is limited by the heaviest product handled. The lightest or least viscuous is 100-octane gasoline.

Since beginning of operations, the volumes handled through April 30, 1945 have been as follows:

Deliveries New York

Product	M, Bbl
100 Octane	30,700
80 Octane	13,428
72 Octane	13,658
Housebrand	8,606
68 Octane	68
No. 2 Heating Oil	13,518
7-0-2 Navy Diesel	4,002
	83,980

Deliveries: Norris City

No. 2 Heating Oil	183

Total Deliveries to Consignees ------ 84,163

Although limited to less than original design operating pressure, the peak day thruput was 239,844 barrels.

At the beginning of operations, the line had a considerable accumulation of rust and dirt, which caused difficulties with pump packing. Internal corrosion typical of refined products lines soon was in evidence; application of an inhibitor to the products being pumped had this problem well in hand, and it is not necessary to use filters or scrapers more than once a month.

Again comparing pipe line volumes with railroad transportation, this movement is equivalent to nearly 1100 tank cars daily, or 14 trainloads all the way from the Gulf Coast to New York. It would require an average of better than two pre-war tankers per day.

The actual performance of these two lines is remarkable because there is no standby, or reserve, equipment at any station. There has been no lost time due to leaks or line trouble. Most interruptions have been due to electric power failures, or voltage variations attributable to storms.

No small item in operating costs is an electric power bill for both systems of around three quarters of a million dollars per month. Operating costs, however, have been substantially less than estimated.

It has been stated on high authority that Allied invasion of enemy territory in Europe would not have been possible nor could it have been sustained without the aid of Big Inch and Little Big Inch lines.

Constructed in record time, under wartime limitations, the two lines have delivered to the Eastern Seaboard over 316,000,000 barrels of crude oil and refined products, through April, 1945.

OIL COMPANIES MADE RECORD EARNINGS IN 1944

By Henry E. Rose

THE American Petroleum industry established new records in all divisions of operations in 1944. In consequence, its aggregate net profits last year were at a new peak, surpassing by almost 13 percent the previous record attained in 1937.

War's demands for oil products continue to be reflected in a further rise in the industry's activity this year, and a high level of operations is indicated. Profits, on the whole, are expected to equal, or slightly better, those of 1944. During the first quarter of this year aggregate net income, based on the reports thus far available, show an increase of approximately 10 percent compared with the corresponding period a year earlier. For twenty-nine companies reporting for the March quarter of this year, aggregate net profits were $81.9 million compared with $74.1 million in the similar three months of 1944. Twenty-two companies showed increases.

Even with the defeat of Germany in the European war (V-E Day), the high demand for oil is expected to continue in order to furnish needs of a more active and all-out offensive against Japan in the Pacific. There will be minor shifts as the result of the change in the war theatres, however, insofar as the oil industry is concerned, but only the major oil product—gasoline—is expected to be affected.

After V-E Day the needs of only one front will mean a smaller use of ordinary gasoline and thus supplies for civilian use are expected to be increased. This increase for civilians, however, is estimated at only 100,000 to 200,000 barrels daily and, at best, will give "A" motorists, for example, not more than 50 percent above their present allotments and possibly less.

Fuel and diesel oils are expected to continue in heavy demand right up to the end of the Japanese war so that there is little likelihood of civilians' getting any relief in their supplies of heating oil.

At the conclusion of both wars the effect upon the oil industry's operations, according to economists, will be an immediate decline in demand —largely because of a sharp curtailment in military needs—and an oversupply of both crude oil and refined products. This condition is expected to be only temporary, however, and another of the periods through which the industry will readjust itself to a peacetime basis from the sharply enlarged scale of operations established to meet war demands.

For the longer range outlook, say five years, the gasoline demand sights are set at new record industry an opportunity to satisfy the pent-up demand for new motor cars and rebuild the car population which, since the war's beginning in 1941, has probably declined by as much as 40 percent.

Fuel oil demand also is projected at higher levels consequent upon several factors; principally, (1) the installation of many oil burners in new homes to be constructed after the war; (2) the expansion in dieselization of locomotives and increased use of diesel engines in industry, and (3) the prospective maintenance of a much greater merchant marine and navy, both important users of fuel oils.

For the first four months of this year the production of crude oil ran approximately 7.5 percent ahead of the same period in 1944. Refinery runs of crude oil this year, in that period, were about 10 percent higher than in 1944. Demand for all products, moreover, in this year to date has been running ahead of 1944.

A factor of importance in current and future earnings of the industry is a tax decision handed down by the Fifth Circuit Court of Appeals, in New Orleans, La., early in March. That decision would negate the option granted by the Bureau of Internal Revenue to the industry to charge as a current expense, or to capitalize, intangible costs such as labor, haulage, fuel and so forth in well drilling.

The industry has been expensing these costs for almost twenty-five years in accordance with the Bureau of Internal Revenue's regulations. If they are to be capitalized, as the Court's decision implies, the industry might be called upon to make retroactive tax payments, some of which would be almost unbearable. Besides, the decision, if enforced, will mean a sharp curtainment in drilling operations.

To offset this adverse court decision, and to assure that these intangible costs may continue to be expensed, the industry petitioned for a rehearing of the case. While the court denied the motion for a rehearing, stressing that it found "no fault" in its previous reasoning, it did specify that the original decision apply only to the company involved. This leaves the industry to continue the practice of expensing intangibles but still uncertain as to the future. Simultaneously, through its state and national associations, it has made an appeal to Congress for legislative action which would clearly permit the practice of expensing such intangible costs. Several bills have been introduced to correct the action of the court decision.

Meanwhile, the Bureau of Internal Revenue has stated that it does not intend to make any alteration in the regulations and that the companies may continue the practice of expensing these costs. It is expected that, as the result of Congressional action, there will be no change in the handling of intangibles. Capitalization has been one of the tax measures sponsored by the administration for years but Congress has consistently refused to adopt specific legislation to enforce this procedure.

Another factor for the future is the course of crude oil prices. There has been no general increase in these prices since before Pearl Harbor in spite of the fact that labor and material costs have risen sharply in the four-year period. All efforts of the industry to obtain higher levels have been opposed by the Office of Price Administration which, to offset a general increase, has developed a program of governmental subsidy payments ranging from a few cents a barrel upward, and applying only to high-cost, small production, areas.

The latest effort of the industry to obtain a general price increase is represented by the decision to send questionnaires to approximately 700 producers in the United States seeking information on finding, development and production costs for an eight-year period—four before the war and four during the war. The questionnaire is the result of conferences between an industry committee and the Office of Price Administration, and follows the recommendation of the Small Business Committee of the House of Representatives that higher crude prices are warranted.

In discussions concerning the questionnaire the O.P.A. was adamant in its opposition to the recognition of replacement costs as a basis for price determination while the industry insisted on this as a yardstick. It was decided, after several months of discussion, to include a section in the questionnaire asking for this information on replacement costs, even though the OPA has gone on record in opposition to it. The industry committee hopes, when the information is furnished, that this replacement cost material will be included in its summary of production costs and aid in obtaining a general increase in prices. Failing to obtain better prices with this information, the alternative appears to be only an appeal for Congressional action and many in the industry believe that this step will be necessary.

Crude oil prices today, the industry contends, are inadequate in view of the higher labor and material costs involved in drilling. For all practical purposes, the industry is selling its oil for less than replacement cost and its posi-

tion is tantamount to that of a merchant who sells from his shelves goods acquired years ago at lower prices but which could not be replaced at today's price.

Last year's record profits of the American oil industry reflect chiefly the peak volume of sales made, plus the fact that these sales represent oil largely discovered and developed at much lower costs than those that prevail under today's conditions. Liquidation, to a large extent, is a part of current profits. The 1944 profits of the industry, for comparative purposes, were approximately 13 percent higher than those in 1937, the previous record year. Production of crude oil, however, at 1,678 million barrels last year was 31 percent higher than in 1937.

For 23 leading American companies whose shares are listed on principal exchanges, net profits in 1944 aggregated $684,061,000, an increase of 26.8 percent over the $539,260,000 netted in 1943. After allowing for perferred dividends paid by companies with such issues outstanding, the 1944 net profits were equal to $3.45 a share of common stock outstanding (195,946,441 shares). This compared with the equal of $2.72 a share earned on common in 1943 when 196,216,686 shares were outstanding, and with $3.20 a share in 1937, the previous record year.

With a higher level of profits in 1944 the companies, taken as a whole, distributed a larger amount in cash dividends to their common stockholders. The total payments by the 23 companies amounted to $298,248,000, equal to 42 percent of the year's net profits, and an increase of almost 20 percent compared with the $249,447,000 paid in 1943. Fourteen of the companies made larger cash payments on common stock in 1944.

Among the companies disbursing larger payments were Amerada Petroleum Corp. which paid $3 against $2 in 1943; Atlantic Refining Co. $1.50 against $1; Continental Oil $1.20 against $1; Gulf Oil Corp. $2. against $1.50; Humble Oil & Refining Co. $1.50 on new stock, equal to $3 on old stock against $2.50; Ohio Oil Co. $1 against 75 cents; Shell Union Oil Corp. $1.50 against $1.25; Pure Oil Co. $1 against 75 cents; Sinclair Oil Corp. 67-1/2 cents against 50 cents; Skelly Oil Co. $1.75 against $1.50; Socony-Vacuum Oil Co., Inc. 75 cents against 50 cents; Standard Oil Co. (N. J.) $2.50 against $2; Texas Co. $2.50 against $2, and Tide Water Associated Oil Co. $1 against 85 cents.

Of last year's profits, the largest gains were shown by fully integrated companies, both domestic and those with foreign affiliates. The profits of solely producing companies, and those with more production than is needed in their refinery operations, were mixed. Two of the latter showed small reductions while the others had smaller gains than the fully integrated companies which depend on other sources for a part of their supply of crude. More extensive exploratory and development programs, together with higher drilling costs, most of which are charged directly to current operations, were responsible for holding down net profits of the solely producing, or major producing, companies. The latter's production and sales, on the other hand, showed sizeable increases over 1943.

Outstanding gains in profits last year were shown by Atlantic Refining Co.; Pure Oil Co.; Gulf Oil Corp.; Humble Oil & Refining Co.; Phillips Petroleum Co.; Shell Union Oil Corp.; Sinclair Oil Corp.; Skelly Oil Co.; Socony-Vacuum Oil Co. Inc. (a large part due to non-recurring tax items); Standard Oil Co. of California; Standard Oil Co. of Indiana; Standard Oil Co. (N. J.): Standard Oil Co. of Ohio; Texas Co. and Tide Water Associated Oil Co.

In the foreign field, Creole Petroleum Corp., an affiliate of Standard Oil Co. (N. J.), operating in Venezuela, experienced a sharp gain in 1944 profits to $62,020,000, equal to $2.33 a share of outstanding capital stock, compared with $28,559,169 in 1943. Aiding Creole last year was a record production of crude oil, combined with the availability of transportation to move its output.

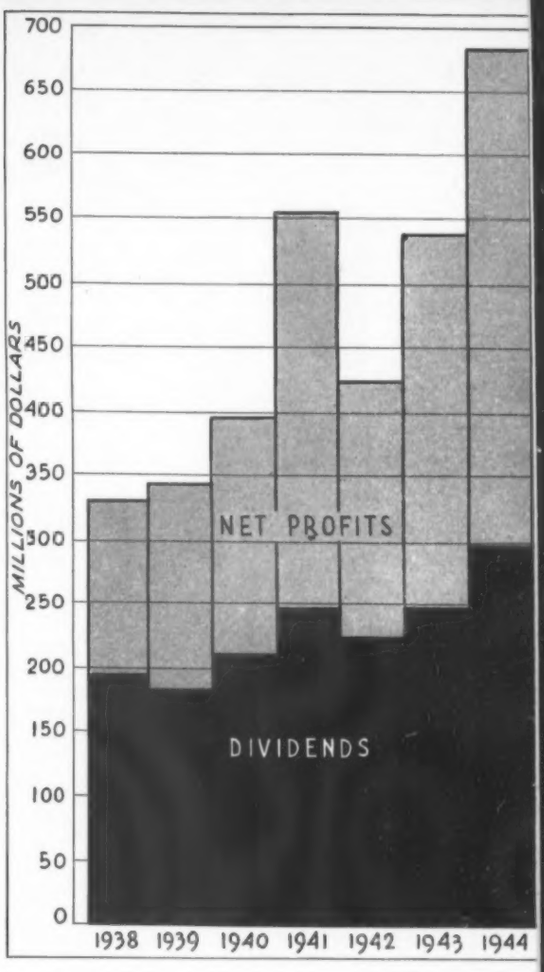
Imperial Oil Limited, another affiliate of Standard Oil Co. (N. J.), operating in Canada but with a South American producing subsidiary, had only a small increase in profits last year—4.1 percent compared with 1943.

Funded and long term debt of the American industry, as represented by the 23 companies in WORLD PETROLEUM's tabulation, declined last year by $48 million to the lowest level since 1941. It aggregated $984.3 million and compared with $1,032 million in 1943.

Increases were shown by only three companies last year. One was unimportant and less than a million dollars in the case of Texas Co. The two companies to show larger increases were Phillips Petroleum Co. and Union Oil Co. In the case of Phillips, its long term debt at the end of 1944 amounted to $48.8 million against $28.7 million a year earlier. The company early in 1944, sold a $40 million issue of 2-3/4 percent debentures, using $14.5 million of the proceeds to retire long term bank loans and adding the remainder to working capital.

Union Oil Co. last year increased its funded debt to $53.7 million from $42.5 million at the end of 1943. It borrowed $12 million at banks, principally to finance the purchase of Glacier Production Co., in the northwest, and added a small part of the proceeds to treasury funds to replace withdrawals in connection with the company's major construction program.

Since the turn of the year, Continental Oil Co. has added to its funded debt by borrowing $15 million from banks to finance the acquisition,



in March of this year, of Navarro Oil Co., a crude producer in the southwest.

Tide Water Associated Oil Co., during the summer of 1944 sold $24.5 million of serial notes, using $16.5 million of the proceeds to retire its 2 3/4 percent debentures. Moreover, in April of this year the company offered 300,000 shares of a new $3.75 cumulative preferred stock in exchange for its outstanding $4.50 cumulative preferred stock on a share-for-share basis, and subject to pro-rata allotment since there are 500,000 shares of the $4.50 preferred shares outstanding. The unexchanged $4.50 preferred and the remaining shares will be redeemed on July 1.

Standard Oil Co. of Ohio made two offers to redeem 25,000 shares each of its outstanding 4 1/2 percent preferred stock. In addition, the company's stockholders early in April, voted to split the common stock on a 2 1/2-for-one basis lifting the authorized issue to 3,250,000 shares from 1,300,000 shares, and changing the par value to $10 from $25.

Incident to the sharp rise in profits last year, the 23 American companies added $173 million to their working capital, increasing the total to $2,258 million from $2,085 millior at the close of 1943. The larger working funds will play an important role in the adjustment to peace-time conditions, especially during the immediate period thereafter of overproduction of crude and a

(*Continued on page* 94)

FIVE YEAR FINANCIAL REVIEW OF

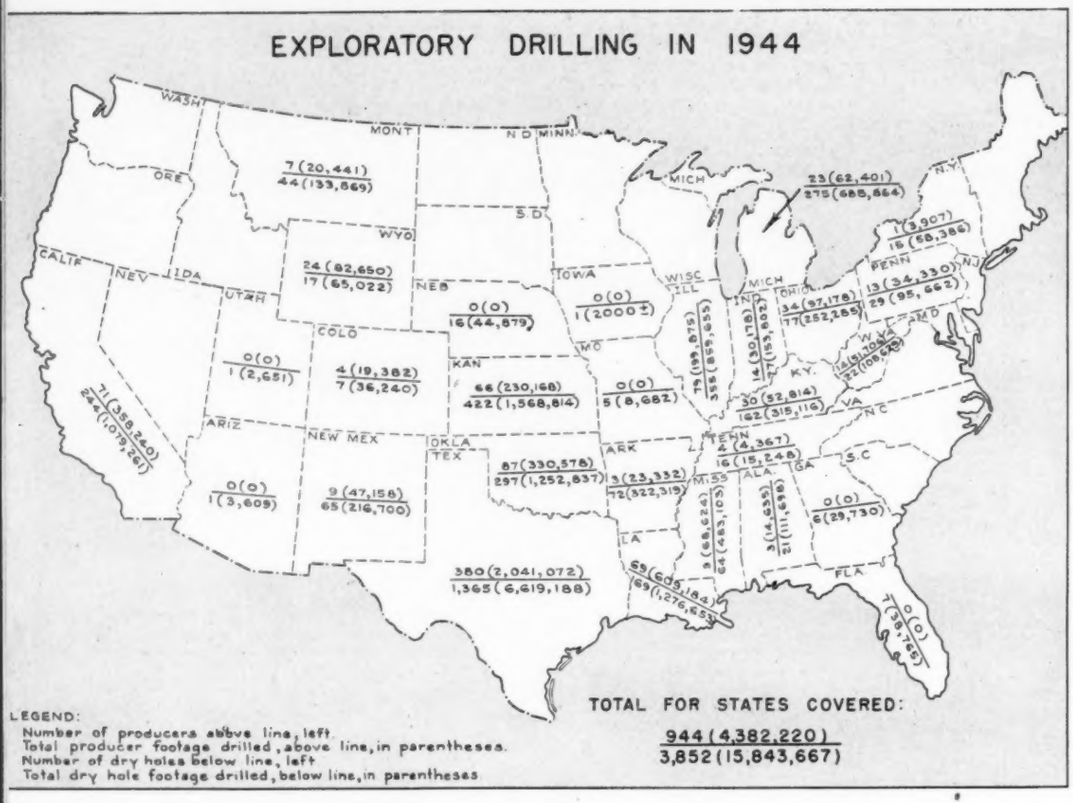
	Net Income	Per Share of Com.	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt	No. of Pref. Shares	No. of Com. Shares	Surplus
Amerada Corp.								
1944	$5,285,988	$6.70	$8,566,051	$15,927,801	.....	.....	788,675	$13,585,670
1943	4,781,771	6.06	8,615,413	13,434,753	.....	.....	788,675	10,665,707
1942	3,271,885	4.15	5,542,107	12,714,027	.....	.....	788,675	7,461,287
1941	2,569,560	3.26	3,473,258	12,682,721	.....	.....	788,675	5,766,751
1940	1,775,734	2.25	3,124,396	12,016,406	.....	.....	788,675	4,774,541
Atlantic Refining Co.								
1944	14,710,913	5.30	45,675,417	192,279,722	$31,009,123	148,000	2,663,998	118,061,797
1943	10,687,828	3.79	44,630,707	180,655,671	32,632,928	148,000	2,663,998	105,669,559
1942	6,800,002	2.33	53,403,548	158,643,694	26,305,709	148,000	2,663,998	96,943,179
1941	14,346,229	5.16	44,036,326	161,670,211	25,024,849	148,000	2,663,998	92,643,137
1940	6,217,453	2.11	45,152,518	145,997,524	25,124,849	148,000	2,663,999	80,629,957
Barnsdall Oil Co.								
1944	3,674,766	1.65	5,498,163	15,977,894	.....	.....	2,223,307	10,861,185
1943	3,602,764	1.62	5,546,689	14,233,620	.....	.....	2,223,225	9,024,509
1942	2,801,846	1.26	3,752,756	14,139,303	.....	.....	2,223,579	7,109,812
1941	(B) 5,026,202	2.25	2,928,159	12,897,743	3,140,000	.....	2,231,879	5,657,951
1940	2,193,471	.97	4,031,723	13,106,604	7,562,757	.....	2,251,017	1,926,084
Continental Oil Corp.								
1944	12,020,527	2.57	30,132,843	88,999,748	1,518,244	.....	4,916,987	103,234,221
1943	14,080,702	3.00	32,727,193	82,290,941	2,806,743	.....	4,682,561	100,004,761
1942	14,924,698	3.19	27,954,923	82,045,727	5,859,055	.....	4,682,563	91,806,436
1941	15,398,082	3.29	17,646,983	82,010,052	8,714,875	.....	4,682,565	81,564.115
1940	4,317,658	.92	30,010,809	73,082,217	21,906,177	.....	4,682,568	70,848,410
Creole Petroleum Corp.								
1944	62,020,396	2.33	37,850.361	166,578,162	.....	.....	26,606,610	74,241,889
1943	(C) 28,559,169	1.07	20,788,692	154,684,278	.....	.....	26,606,610	45,479,756
1942	3,469,000	.50	4,360,149	75,539,403	.....	.....	6,974,356	45,720,611
1941	12,297,275	1.76	8,193,304	73,259,828	.....	.....	6,974,356	47,679,036
1940	6,834,170	.98	4,113,744	71,507,758	.....	.....	6,974,356	42,356,117
Gulf Oil Corp.								
1944	42,075,513	4.64	101,635,902	409,833,584	48,443,118	.....	9,076,202	181,254,656
1943	29,301,053	3.29	101,190,142	382,301,066	52,992,991	.....	9,076,202	153,516,655
1942	22,981,562	2.53	79,139,104	378,603,898	42,912,760	.....	9,076,202	137,829,905
1941	33,568,624	3.70	80,951,044	372,056,770	46,155,801	.....	9,076,202	128,462,646
1940	22,150,277	2.44	125,388,013	257,743,026	48,590,062	.....	9,976,202	107,609,862
Humble Oil & Refining Co.								
1944	60,525,774	3.37	82,299,423	353,559,531	42,662,491	.....	17,915,680	221,796,955
1943	45,711,511	2.54	70,668,062	341,516,999	53,533,744	..... (E)	17,975,680	188,234,701
1942	29,243,303	3.25	56,022,566	336,571,341	52,570,414	.....	8,987,840	164,992,790
1941	35,356,558	3.93	45,823,214	325,080,832	42,014,167	.....	8,987,940	154,036,877
1940	28,107,503	3.13	41,137,524	313,065,476	42,417,737	.....	8,987,940	138,406,211
Imperial Oil, Ltd.								
1944	16,192,670	.60	74,702,544	38,879,829	.....	.....	26,965,078	59,441,568
1943	15,548,873	.57	69,604,722	40,455,813	.....	.....	26,965,078	56,345,318
1942	14,663,097	.54	60,583,509	44,826,797	.....	.....	26,965,078	54,021,208
1941	16,144,069	.60	56,767,380	43,103,735	.....	.....	26,965,078	53,383,418
1940	17,635,717	.65	45,061,925	41,243,450	.....	.....	26,965,078	50,721,888
Mid-Continent Petroleum Corp.								
1944	6,942,038	3.74	35,820,077	37,201,893	.....	.....	1,857,912	54,341.053
1943	6,566,618	3.53	32,729,621	36,450,773	.....	.....	1,857,912	50,583,350
1942	6,112,158	3.29	30,603,308	35,443,077	.....	.....	1,857,912	47,465,394
1941	4,866,036	2.62	25,110,651	36,035,163	.....	.....	1,857,912	44,893,313
1940	2,967,394	1.60	21,549,569	37,074,524	.....	.....	1,857,912	42,627,669
Ohio Oil Co.								
1944	15,082,127	2.30	30,683,091	80,316,287	11,000,000	.....	6,563,377	44,417,766
1943	14,146,802	2.14	26,347,464	76,236,983	12,500,000	.....	6,563,377	35,899,013
1942	12,508,953	1.74	22,779,178	80,310,995	12,500,000	57,046	6,563,377	31,015,260
1941	10,799,736	1.42	24,895,921	89,838,837	15,500,000	212,233	6,563,377	24,405,355
1940	8,733,164	1.02	31,772,031	88,050,956	14,000,000	339,337	6,563,377	19,772,774
Phillips Petroleum Co.								
1944	20,952,088	4.26	30,752,672	235,972,999	48,812,688	.....	4,916,987	68,853,374
1943	14,168,422	3.04	24,494,808	205,917,876	28,707,826	.....	4,916,987	57,535,250
1942	13,129,457	2.95	33,630,615	188,723,195	38,608,431	.....	4,492,980	52,739,178
1941	17,346,977	3.92	30,001,026	180,708,712	33,923,259	.....	4,449,052	48,507,824
1940	11,590,317	2.61	29,130,002	173,186,916	32,589,696	.....	4,449,052	41,081,214
Pure Oil Co.								
1944	16,392,178	3.11	40,060,767	(A) 133,029,554	2,415,806	725,431	3,982,431	(A) 67,813,020
1943	13,874,517	2.50	32,089,974	151,721,887	2,829,457	725,431	3,982,031	78,833,591
1942	13,761,826	2.47	30,915,653	126,026,907	3,174,175	725,431	3,982,031	71,853,446
1941	15,285,255	2.86	24,719,281	123,223,061	2,952,147	725,431	3,982,031	63,990,259
1940	8,718,057	1.21	22,700,307	115,237,430	3,478,686	725,431	3,982,031	54,604,294
Seaboard Oil Co.								
1944	1,881,284	1.52	3,452,654	7,841,302	2,433,333	.....	1,234,235	5,178,190
1943	1,949,096	1.58	4,512,666	7,410,791	3,040,000	.....	1,234,237	4,097,062
1942	1,463,706	1.18	3,314,271	7,620,841	3,440,000	.....	1,234,252	3,816,255
1941	1,257,367	1.02	2,118,383	4,546,182	.....	.....	1,229,083	3,146,415
1940	1,300,993	1.05	2,698,551	3,980,081	.....	.....	1,244,383	3,439,929

(A)
(B)
(C)
(E)

UNITED STATES OIL COMPANIES

	Net Income	Per Share of Com.	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt.	No. of Pref. Shares	No. of Com. Shares	Surplus
Shell Union Oil Corp.								
1944	$28,163,961	$2.09	$114,096,944	$213,471,518	$84,873,000	.....	13,470,625	$50,404,897
1943	24,542,556	1.82	90,151,050	222,510,924	94,135,000	.....	13,470,625	42,446,874
1942	16,860,007	1.28	95,774,423	199,551,494	104,278,000	.....	13,070,625	34,086,647
1941	17,334,214	1.32	84,067,926	228,964,879	108,961,000	.....	13,070,625	36,648,283
1940	15,654,678	1.05	95,975,926	227,769,292	85,000,000	331,225	13,070,625	34,797,441
Sinclair Oil Corp.								
1944	27,367,794	2.28	92,255,494	241,573,524	61,706,525	.....	11,974,094	226,508,979
1943	23,083,709	1.85	89,494,580	239,682,758	66,801,857	.....	12,928,205	209,148,169
1942	18,060,598	1.42	101,393,765	216,238,439	92,395,928	.....	13,651,405	193,038,459
1941	16,472,494	1.25	83,592,829	216,209,874	79,582,000	.....	13,128,953	181,692,426
1940	3,792,602	.28	91,144,403	194,838,625	69,030,627	.....	13,531,915	172,115,495
Skelly Oil Co.								
1944	7,222,903	7.36	11,541,852	58,319,784	10,000,000	.....	981,349	44,535,759
1943	5,461,708	5.56	11,772,045	53,808,491	11,200,000	.....	981,349	39,154,199
1942	5,632,805	5.73	11,863,363	52,375,519	13,600,000	.....	981,348	35,164,513
1941	5,913,826	6.02	8,445,051	51,063,964	14,800,000	.....	981,348	30,758,394
1940	3,316,678	3.28	7,694,042	48,279,943	16,000,000	.....	981,348	26,316,591
Socony-Vacuum Oil Co., Inc.								
1944	62,349,536	2.00	280,510,156	511,462,505	118,077,823	.....	31,708,452	229,990,725
1943	35,944,983	1.15	271,335,854	499,503,866	126,716,312	.....	31,708,452	191,024,911
1942	30,808,397	.99	234,062,698	481,070,509	123,674,996	.....	31,708,452	170,669,089
1941	43,175,902	1.38	216,888,148	471,740,585	126,383,580	.....	31,708,452	155,449,853
1940	36,409,055	1.17	197,297,070	455,058,914	133,727,410	.....	31,708,452	178,320,612
Standard Oil Co. of California								
1944	43,467,997	3.34	122,616,220	466,865,826	40,000,000	.....	13,003,953	260,871,654
1943	36,116,060	2.78	111,393,415	466,335,156	40,000,000	.....	13,003,953	245,657,323
1942	30,551,547	2.35	93,310,560	470,851,310	40,000,000	.....	13,003,935	239,748,878
1941	29,909,421	2.30	103,755,136	455,881,836	40,000,000	.....	13,003,953	231,337,260
1940	22,487,566	1.73	88,553,262	445,593,600	25,000,000	.....	13,102,900	230,320,612
Standard Oil Co. of Indiana								
1944	59,225,578	3.87	181,904,301	539,352,256	12,042,641	.....	15,284,864	409,881,287
1943	50,591,371	3.31	186,639,059	498,147,998	17,537,965	.....	15,284,876	377,731,563
1942	44,183,893	2.89	203,989,055	443,433,258	16,453,283	.....	15,284,892	348,050,454
1941	48,385,967	3.17	185,923,067	431,134,060	14,698,741	.....	15,284,935	319,452,179
1940	33,597,342	2.20	191,548,946	396,068,183	19,488,465	.....	15,271,982	294,114,662
Standard Oil Co. (N. J.)								
1944	155,396,460	5.69	697,078,842	1,103,125,811	214,855,260	.....	27,333,742	697,078,482
1943	121,327,773	4.45	585,859,209	1,092,251,188	232,157,560	.....	27,283,587	672,584,273
1942	83,361,920	3.06	495,667,607	1,104,036,333	248,072,906	.....	27,283,587	642,011,449
1941	140,572,419	5.15	506,275,556	1,040,832,931	194,512,825	.....	27,283,587	636,189,422
1940	123,886,346	4.54	485,854,976	1,078,223,509	187,553,785	.....	27,278,666	618,087,745
Standard Oil Co. of Ohio								
1944	6,744,014	7.07	24,173,817	74,989,555	20,199,617	221,389	807,585	41,466,795
1943	4,905,634	5.68	20,098,777	67,853,801	22,179,327	221,389	758,519	37,729,768
1942	5,649,880	6.68	26,286,564	57,335,786	23,151,743	120,000	756,265	34,437,272
1941	6,249,443	7.47	17,566,209	51,799,637	9,446,676	120,000	752,265	31,088,988
1940	6,209,008	7.44	13,259,188	47,677,770	5,314,681	120,000	753,740	27,285,388
Sun Oil Co.								
1944	13,350,217	4.15	60,254,429	110,955,911	34,739,756	92,197	3,119,582	27,344,493
1943	13,353,524	4.56	59,380,803	104,366,531	35,894,794	93,197	2,838,929	27,062,509
1942	8,671,050	2.91	50,339,826	99,510,033	29,025,154	93,107	2,838,929	18,263,495
1941	16,532,540	6.21	36,011,101	93,470,154	21,007,495	93,107	2,850,826	13,604,990
1940	7,969,068	3.03	22,552,302	93,278,795	18,066,869	100,000	2,434,840	15,958,344
The Texas Co.								
1944	54,516,819	4.85	176,565,106	431,780,673	124,600,469	.....	11,244,660	293,056,581
1943	42,889,797	3.83	176,654,852	415,353,085	123,998,331	.....	11,186,279	265,299,559
1942	35,060,001	3.32	174,619,189	368,886,617	106,000,000	.....	10,875,627	237,718,261
1941	51,874,681	4.77	148,797,057	366,505,822	111,801,380	.....	10,875,800	222,837,338
1940	31,547,662	2.90	124,231,625	365,656,993	111,834,697	.....	10,875,994	197,634,702
Tide Water Associated Oil Co.								
1944	17,787,202	2.43	49,971,786	147,485,770	21,250,000	500,000	6,386,809	61,118,436
1943	14,902,640	1.98	58,391,066	133,722,641	30,436,400	500,000	6,389,394	50,267,921
1942	10,663,930	1.32	49,561,629	134,115,502	33,436,400	500,000	6,375,364	42,890,964
1941	15,564,093	2.09	42,482,262	137,982,146	36,936,400	500,000	6,374,033	37,342,776
1940	9,519,083	1.14	39,973,976	132,143,846	38,200,000	500,000	6,372,676	33,148,237
Union Oil Co. of California								
1944	8,932,994	1.91	34,357,126	168,599,514	53,700,000	.....	4,666,270	32,248,766
1943	7,269,199	1.56	41,071,274	144,962,486	42,544,000	.....	4,666,270	27,525,466
1942	5,537,329	1.19	48,758,124	133,893,458	43,639,000	.....	4,666,270	24,249,878
1941	6,239,232	1.34	36,622,981	130,271,906	37,480,000	.....	4,666,270	23,840,595
1940	4,606,790	.99	44,936,309	120,260,932	37,958,500	.....	4,666,270	22,283,270

(A) Giving effect to writeoffs in November, 1944, of $19,523,031 of patents, rights, trademarks, etc.
(B) Including a non recurring profit of $2,515,996 from the sale of West Texas lands.
(C) Adjusted to give effect to Lago Petroleum Corp. earnings for all of 1943.
(E) Stock split two-for-one late in 1943, and per share net is on larger share basis.



EXPLORATORY DRILLING IN 1944*

By Frederic H. Lahee

Chief Geologist, Sun Oil Company.

IN preparing this report on the progress of exploratory drilling for oil in the United States in 1944, there has been included, as usual, the total footage of new drilling throughout the country, including wildcats (both new-field wildcats and new-pool wildcats), outpost wells, deeper-pool tests and shallower-pool tests. For all but the deeper-pool tests exploratory footage includes the total footage drilled in each hole, whether a producer or a dry hole, but in the case of the deeper-pool tests only the footage drilled below the deepest producing formation penetrated by the well is included. These 1944 figures my thus be consistently compared with those published in the author's reports of 1939 to 1943.**

A bird's eye-view of new drilling activity relating to the statistics of number of exploratory tests drilled and their total footage may be had by looking at the United States map herewith. On this map the numbers in parenthesis indicate total footage drilled; figures preceding parenthesis indicate the number of holes drilled; figures above the cross line are for producing wells; that is, oil, oil and gas, condensate (distillate) and gas, and gas; and figures below the cross line are for dry holes.

In the states covered in this review, shown on the map and listed in Table II, during 1944 a total of 20,223,918 feet was drilled in 4,796 exploratory holes, divided as follows:

944 producers ------ 4,382,220 ft.
3,852 dry holes ------ 15,843,667 ft.

This means that 19.6 percent of the holes drilled, and 21.1 percent of the footage drilled were successful in 1944. One producer foot was drilled for every 3.61 feet of dry hole. One successful well was drilled for every 4.08 dry holes. The average depth of hole was 4,217 feet.

In the southern states district, comprising eight states (N. Mex., Tex., Ark., La., Miss., Ala., Ga. and Fla.), in 1944, a total of 11,899,426 feet was drilled in 2,238 holes, divided as follows:

473 producers ------- 2,804,005 ft.
1,765 dry holes -------- 9,095,421 ft.

In this area, then, 21.1 percent of the holes drilled, and 23.5 percent of the footage drilled were successful. One producer foot was drilled for every 3.24 feet of dry hole. One successful well was drilled for every 3.73 dry holes. The average depth of hole was here 5,317 feet.

To those concerned with the risky business of exploratory drilling for oil it is interesting to observe on what grounds drilling sites are chosen. Selection of the location for a wildcat well may be based on geology (surface geology, subsurface geology, trend along known regional—or shallow exploratory drilling); or it may be based on geophysics (exploration by seismograph, torsion balance, gravity meter, magnetometer, et cetera); or it may be based on some non-technical suggestion or requirement, such as "creekology", "hunch", "doodlebug", promotion, lease obligation, or reported showing of oil or gas in holes previously drilled. In some cases the reason for choosing the location cannot be ascertained.

TABLE II

Number of Oil Wells, Gas Wells, Condensate Wells, and Dry Holes Drilled as Exploratory Tests in 1944

States	Oil Producers Number of Holes	Oil Producers Footage Drilled	Gas Producers Number of Holes	Gas Producers Footage Drilled	Condensate Producers* Number of Holes	Condensate Producers* Footage Drilled	Dry Number of Holes	Dry Footage Drilled	Total Number of Holes	Total Footage Drilled	Average Depth of Holes†
Alabama	3	14,635	0	0	0	0	21	111,698	24	126,333	
Arizona	0	0	0	0	0	0	1	3,609	1	3,609	
Arkansas	2	16,241	0	0	1	7,091	72	322,319	75	345,651	4609
California	58	283,291	13	74,949	0	0	244	1,079,261	315	1,437,501	4563
Colorado	3	12,377	1	7,005	0	0	7	36,240	11	55,622	
Florida	0	0	0	0	0	0	7	38,765	7	38,765	
Georgia	0	0	0	0	0	0	6	29,730	6	29,730	
Illinois	79	199,875	0	0	0	0	355	859,655	434	1,059,530	2441
Indiana	14	30,178	0	0	0	0	77	153,802	91	183,980	2022
Iowa	0	0	0	0	0	0	1	2,000(?)	1	2,000	
Kansas	54	181,578	12	48,590	0	0	422	1,568,814	488	1,798,982	3686
Kentucky(W)	29	52,147	1	667	0	0	162	315,116	192	367,930	1916
Louisiana	44	343,342	4	32,957	21	232,885	169	1,276,653	238	1,885,837	7924
Michigan	20	55,434	3	6,967	0	0	275	688,864	298	751,265	2521
Mississippi	7	56,329	1	2,328	1	9,967	64	483,103	73	551,727	7558
Missouri	0	0	0	0	0	0	5	8,682	5	8,682	
Montana	4	13,365	3	7,076	0	0	44	133,869	51	154,310	3026
Nebraska	0	0	0	0	0	0	16	44,879	16	44,879	
New Mexico	8	37,566	1	9,592	0	0	65	216,700	74	263,858	3566
New York	0	0	1	3,937	0	0	15	58,386	16	62,293	
Ohio	10	23,268	24	73,910	0	0	77	252,285	111	349,463	3148
Oklahoma	71	278,712	16	51,866	0	0	297	1,252,837	384	1,583,415	4123
Pennsylvania	1	2,085	12	32,245	0	0	29	95,662	42	129,992	3095
Tennessee	1	522	3	3,845	0	0	16	15,248	20	19,615	
Texas	279	1,382,275	38	184,858	63	473,939	1365	6,619,188	1745	8,660,260	4963
Utah	0	0	0	0	0	0	1	2,651	1	2,651	
West Virginia	0	0	14	51,706	0	0	22	108,629	36	160,335	4454
Wyoming	22	75,098	2	7,552	0	0	17	65,022	41	147,672	3602
Totals	709	3,058,318	149	600,020	86	723,882	3852	15,843,667	4796	20,225,887	4217

* In former years the statistics have included condensate wells with gas wells.
† Averages have been recorded here only for states where more than 25 exploratory holes were drilled in 1944.

*Abridged from a report prepared for publication in the Bulletin of the American Association of Petroleum Geologists, June, 1944.

**Bull. Amer. Assoc. Petrol. Cool., Vol. 24, pp. 953-58; Vol. 25, pp. 997-1003, 1938, 1939; Vol. 26, pp. 969-82; Vol. 27, pp. 715-29; and Vol. 28, pp. 701-721.

According to figures from men familiar with such statistics, 844 exploratory holes drilled on technical advice (geology and/or geophysics) were successful (oil or gas), and 3,007 were dry; 90 holes, located for non-technical reasons, were producers, and 735 were dry. Ten producers and 110 dry holes were located for reasons unknown. These figures show that 21.9 percent of the holes drilled on technical advice were producers as contrasted with 10.9 percent successful in the case of the holes located without technical advice. Therefore, in 1944, locations based on technical recommendations were twice as successful as those drilled without such advice. In the eight southern states 8.2 percent of the exploratory holes, located without technical advice, were producers, whereas 22.5 percent of the holes located on technical advice were producers.

Comparing the previous year's figures with those for 1944, the following will be noted:
(1.) There was a considerable increase in the exploratory effort in all important states.
(2.) The average depth of hole, in the states where 25 or more exploratory holes were drilled, decreased in Arkansas, Kansas, Kentucky, and Louisiana, but increased in all other states included in this category. The overall average depth for the United States increased from 3935 ft. to 4217 ft.

In this report there are again submitted special tables relating to the following eleven states: Arkansas, California, Illinois, Indiana, Kansas, Louisiana, Michigan, Mississippi, New Mexico, Oklahoma, and Texas. In Table VI, under A, are recorded the proved reserves as of January 1 in each of the indicated years for the eleven states area under discussion. Under B is shown, for each January 1, the net change in estimated proved reserves since the preceding January 1, allowing for production during that 12-month period. Under C are the new proved reserves which are directly attributable to new-pool discoveries plus new-field discoveries, all made during 1944. Under D are the revisions and additions of estimated proved reserves in fields already discovered in previous years, these revisions and additions having been made partly on the basis of new information obtained through development during the year indicated, but mostly as a result of extensions made to old pools during that year. Under E all the new reserves (C and D) are totalled for each year. If, for each year, we divide the newly discovered proved reserves (C) by the number of exploratory holes drilled in that year, or by the total exploratory footage drilled in that year, we shall have a measure of the degree of success of exploratory drilling in terms of newly discovered proved reserves (G and H); and if we divide the total new proved reserves (discoveries plus revisions plus extensions (E) by the number of exploratory holes drilled, or by the total exploratory footage drilled, we shall have a rough measure of the degree of sucess of the exploratory effort (I and J). Under G and H the measure is short. Under I and J, the measure may be too large or too small. In any case, there is an unavoidable error in estimating rate of discovery, or degree of success in wildcatting, measured in terms of new rereserves; but the figures obtainable by these methods, as here described, are a significant index. As shown on the accompanying graph, they reveal a marked drop in the rate of discovery from 1937 to 1943, inclusive, and this in spite of a steadily increasing footage drilled in exploratory holes and an increasing number of exploratory holes drilled each year. The marked increase in exploratory drilling, indicated in 1943 as compared with 1942, was still more strongly emphasized in 1944, both as to number of holes drilled and as to footage drilled. This great increase—19.2 percent in number of holes and 29.6 percent in total exploratory footage—helped to yield an increase in proved reserves amounting to 9.3 percent of the proved reserves as of January 1, 1944, if we include 1944 production. This was for the "eleven states area". For the whole country the proved reserves as of January 1, 1944, were estimated by the American Petroleum Institute to be 20,064,132,000 barrels, and the proved reserves as of January 1, 1945, 20,453,231,000 barrels, thus showing a net increase of 389,079,000 barrels which, plus the country's production of 1944, totalled 2,067,500,000 barrels. This was 10.3 percent of the proved reserves as of January 1, 1944. In using these figures, however, one should remember that a considerable proportion of these new proved reserves is found through field development wells and through extension (successful outpost) wells. On the other hand, in subsequent years, new proved reserves, added through field development wells and extension wells of those years, will actually be a part of the success of 1944 discoveries of new oil.

TABLE VII

Distribution of Exploratory Wells of 1944 by Classes and Results of Drilling

		All States Included In Table II		Eleven Selected States	
		Number	Percent	Number	Percent
Outposts	Producers	315	41.72	277	43.41
	Dry Holes	440	58.28	361	56.59
Shallower-pool Tests	Producers	18	69.24	14	70.0
	Dry Holes	8	30.76	6	30.0
Deeper-pool Tests	Producers	90	41.86	77	42.07
	Dry Holes	125	58.14	106	57.93
New-pool Wildcats	Producers	179	25.35	145	22.79
	Dry Holes	527	74.65	491	77.21
New-field Wildcats	Producers	342	11.03	297	10.85
	Dry Holes	2752	88.97	2441	89.15
Total Producers		944		810	
Total Dry Holes		3852		3405	
Grand Total		4796		4215	

TABLE VI

Statistics on Proved Reserves (barrels) in Area of Eleven Selected States*

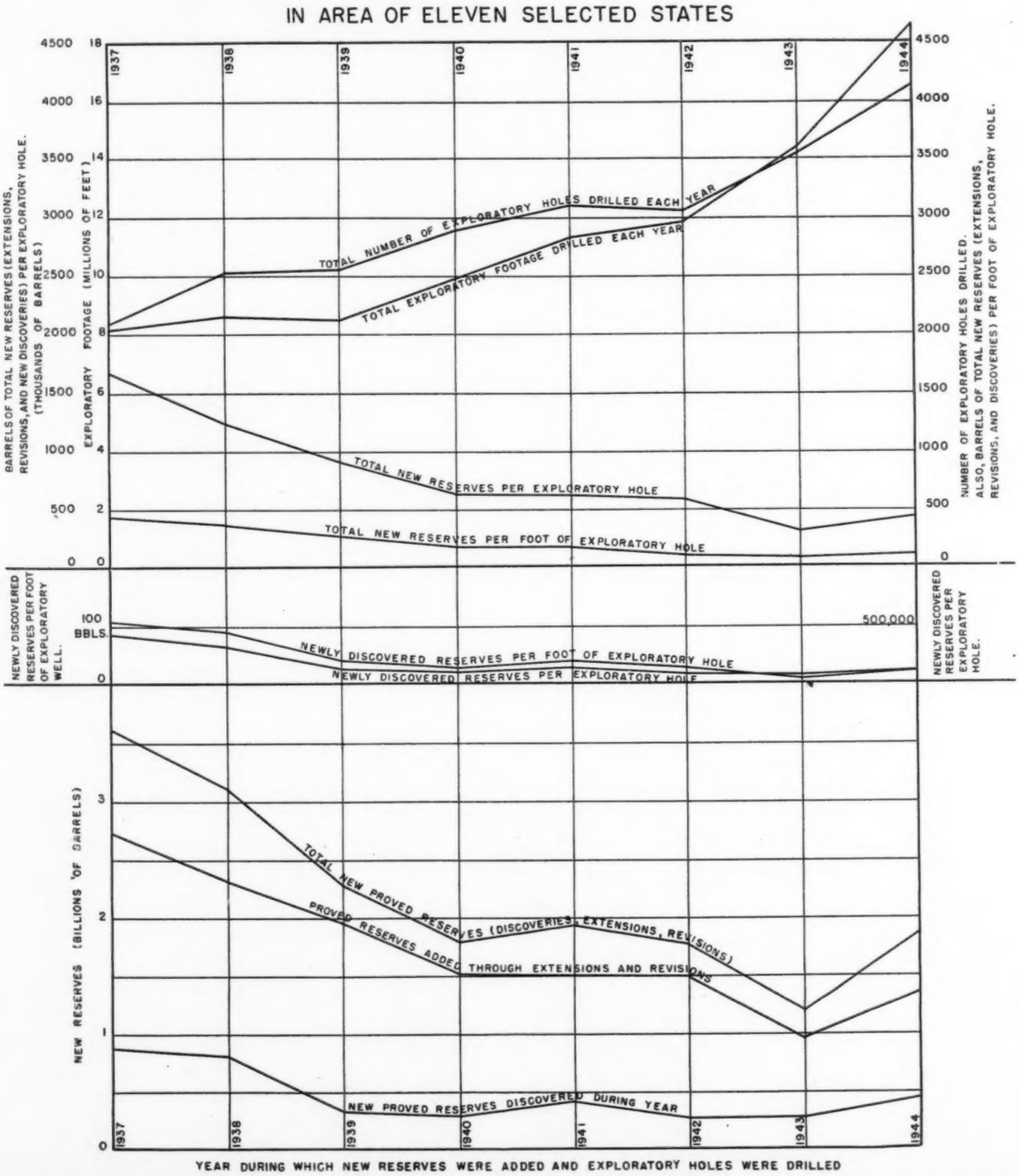
	1937	1938	1939	1940	1941	1942	1943	1944	1945
A. Proved reserves as of Jan. 1 of year indicated	12,241,885,000	14,664,035,000	16,630,452,000	17,723,393,000	18,226,542,000	18,816,785,000	19,260,415,000	19,070,764,000	19,347,407,000
B. Net change in proved reserves since Jan. 1 of previous year	.....	+2,422,150,000	+1,966,417,000	+1,092,941,000	+503,149,000	+590,243,000	+443,630,000	—189,651,000	+276,643,000
C. New proved reserves discovered during year indicated	896,692,000	805,293,000	337,989,000	230,882,000	423,551,000	254,801,000	271,048,000	482,430,000	.....
D. New reserves added through extensions and revisions of old fields during year indicated	2,739,254,000	2,313,356,000	1,955,507,000	1,505,816,000	1,496,610,000	1,496,536,000	963,207,000	1,393,416,000	.....
E. Total new proved reserves added (C+D)	3,635,946,000	3,118,649,000	2,293,496,000	1,786,698,000	1,920,161,000	1,751,337,000	1,234,255,000	1,875,846,000	.....
F. Production during year indicated	1,213,796,000	1,152,231,000	1,200,555,000	1,233,490,000	1,329,918,000	1,307,707,000	1,423,906,000	1,599,203,000	.....
G. Newly discovered reserves (C) per exploratory hole drilled in year indicated	417,647	321,217	133,857	97,834	137,115	83,843	76,652	114,456	.....
H. Newly discovered reserves (C) per foot of exploratory hole drilled in year indicated	109.4	93.6	39.9	28.6	37.7	21.8	11.98	26.04	.....
I. New proved reserves (E) per exploratory hole drilled in year indicated	1,693,500	1,243,976	908,315	622,326	621,612	576,287	349,052	445,041	.....
J. New proved reserves (E) per foot of exploratory hole drilled in year indicated	443.88	362.52	271.36	182.07	170.75	149.79	86.38	101.27	.....

*This area includes Arkansas, California, Illinois, Indiana, Kansas, Louisiana, Michigan, Mississipi, New Mexico, Oklahoma and Texas. All figures are in barrels. These figures on reserves are taken from the published annual reports of the American Petroleum Institute's Committee on Oil Reserves.

In Table VII is shown the distribution of the several classes of exploratory hole drilled in 1944. As might be expected, the percentage of success of outpost wells (from 32.47 percent to 43.41 percent in the different groupings of the states), of shallower-pool tests (from 66.57% to 73.69%), and of deeper-pool tests (from 33.00% to 59.09%), and also of new-pool wildcats (from 22.79% to 48.57%), runs considerably higher than the percentage of success in new-field ("rank") wildcatting (from 10.85% to 12.61%). For this reason some persons have suggested that during the present emergency the exploratory effort be concentrated on new-pool tests, and that much less drilling of new-field wildcats be undertaken. This idea may have been encouraged by the thoughts (1) that under this kind of a program less steel might be required; (2) that pipe-line facilities might already be available for newly found oil; and (3) that at least a part of the preliminary technical exploration would have been accomplished. However, in answer to these thoughts we would remind the advocates of this program (1) that much less steel is needed for a given number of new-field wildcats of average depth than for an equal footage of new-pool tests; (2) that pipelines are now pretty well filled and consequently new-pool discoveries might necessitate new pipeline construction; and (3) that, even after completion of much geological and geophysical investigation, there still remains a large element of risk due to unknown geological conditions on structures that have produced oil. Any reduction in the search for new productive areas, any program that would seriously limit exploration by new-field wildcats, would be a serious menace to the prospects for finding adequate oil reserves in the next few years.

We must beware lest the seemingly easily accomplished upward trend of discovery of new reserves along with the upward trend in exploratory drilling, during 1944, leads to a false impression that the same results may be easily obtained at any time in the future. To maintain an adequate supply of oil reserves, the search for new fields through new-field wildcatting should be carried on uninterruptedly and with increasing stimulation.

STATISTICS ON EXPLORATORY DRILLING AND PROVED OIL RESERVES
IN AREA OF ELEVEN SELECTED STATES


BARRELS OF TOTAL NEW RESERVES (EXTENSIONS, REVISIONS, AND NEW DISCOVERIES) PER EXPLORATORY HOLE.
(THOUSANDS OF BARRELS)
EXPLORATORY FOOTAGE (MILLIONS OF FEET)
NUMBER OF EXPLORATORY HOLES DRILLED.
ALSO, BARRELS OF TOTAL NEW RESERVES (EXTENSIONS, REVISIONS, AND DISCOVERIES) PER FOOT OF EXPLORATORY HOLE.
TOTAL NUMBER OF EXPLORATORY HOLES DRILLED EACH YEAR
TOTAL EXPLORATORY FOOTAGE DRILLED EACH YEAR
TOTAL NEW RESERVES PER EXPLORATORY HOLE
TOTAL NEW RESERVES PER FOOT OF EXPLORATORY HOLE
NEWLY DISCOVERED RESERVES PER FOOT OF EXPLORATORY WELL.
NEWLY DISCOVERED RESERVES PER FOOT OF EXPLORATORY HOLE
NEWLY DISCOVERED RESERVES PER EXPLORATORY HOLE.
100 BBLS.
500,000
NEW RESERVES (BILLIONS OF BARRELS)
TOTAL NEW PROVED RESERVES (DISCOVERIES, EXTENSIONS, REVISIONS)
PROVED RESERVES ADDED THROUGH EXTENSIONS AND REVISIONS
NEW PROVED RESERVES DISCOVERED DURING YEAR
1937
1938
1939
1940
1941
1942
1943
1944
YEAR DURING WHICH NEW RESERVES WERE ADDED AND EXPLORATORY HOLES WERE DRILLED

Japan Losing Hold On Vital Oil Supply

EVEN before the final Nazi surrender in Europe the task of driving the Japanese out of the oil fields they had seized in the early days of their conquest and cutting them off from the petroleum supplies on which the maintenance of their air force and other military operations depends was well under way. One of the important steps in this direction was the completion of the long and hard fought Burma campaign which restored Allied control of the important fields along the Irrawaddy and recovered the refineries around Rangoon.

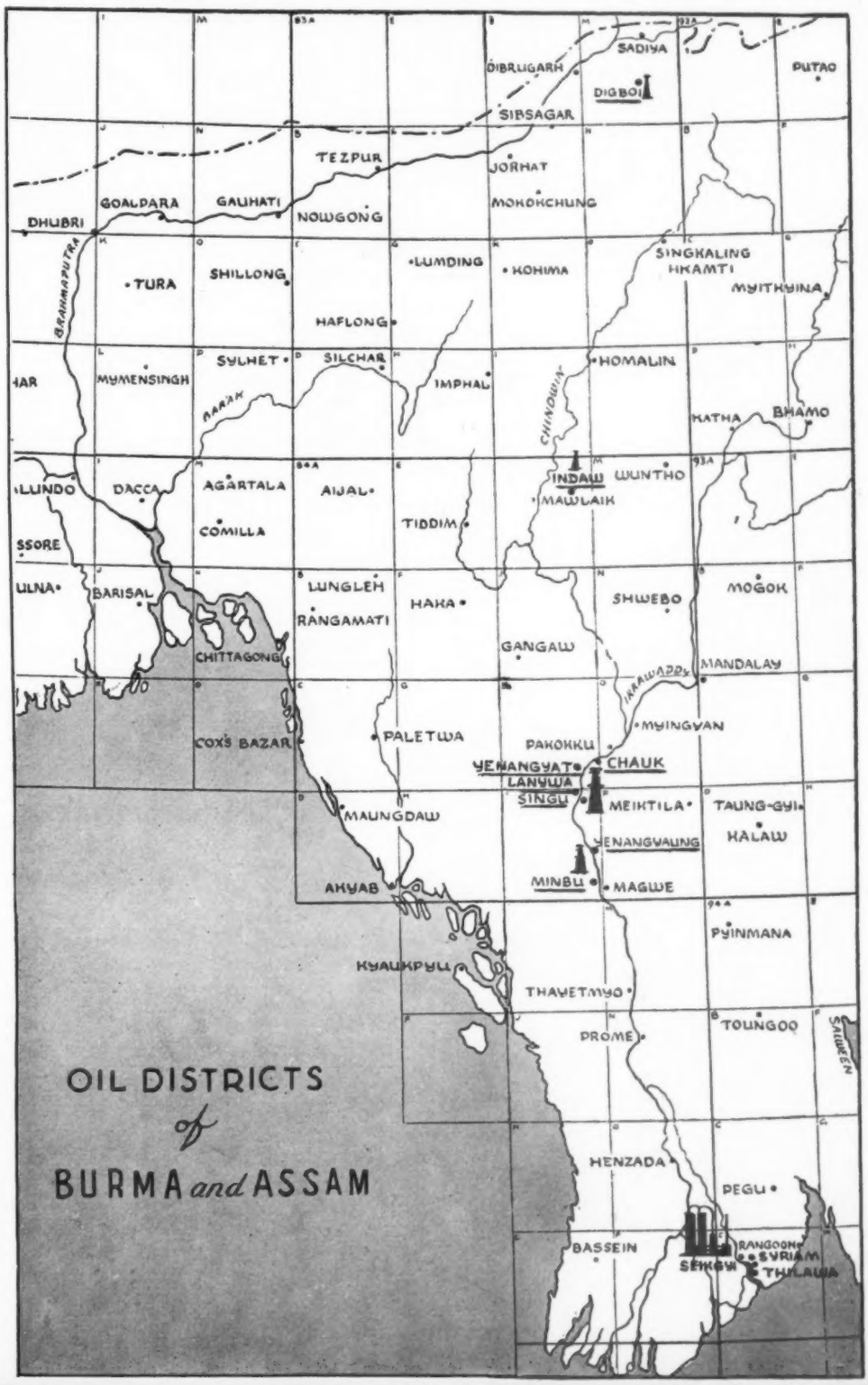
Information is lacking as to the exact extent to which the Nipponese have been able to make use of Burmese oil, although military reports have stated that most of their supplies for the Burma campaigns came from this source. Repossession of the area will be of substantial assistance to the Allies, however. Prior to the war Burma was producing at the rate of about 8,000,000 barrels yearly. A very complete job of destruction was done on the refineries and storage tanks before the British yielded possession but with new equipment and skilled operators available it is not expected to take long to restore partial operation and to resume the output of products that are going to be needed in large volume in that theatre of war.

Up to the time of the Japanese invasion the oil industry was operated by the Burmah Oil Company Ltd. Its fields were located at Yenangyaung, extending along the Irrawaddy River from Magwe to to Chauk, a distance of about fifty miles. Its refineries were located at Syriam, Thilawa and Seikgyi in the Rangoon area. Wells and refineries were connected by a 300-mile pipe line. Late in April a combined British and Indian infantry force drove into the Yenangyaung district, taking the Japanese partially by surprise, and quickly occupied the entire oil field section. At that time it was stated that most of the derricks were in position and that the power lines and stations were intact. Following this success forces moving down from the north and others landed in the delta district south of Rangoon closed in on that city and shortly occupied it.

Further to the north, in Assam, India, the Assam Oil Company Ltd. has a producing field connected by pipe line from Tunsukia to Digboi, with a refinery of 4500 barrels daily capacity at the latter place. These fields, together with those of the Attock Oil Company Ltd. in the Punjab district of northwestern India, are the only ones of importance in southern Asia. The Attock Oil Company has its refinery at Rawalpindi fed by a 42-mile pipe line from Khaur and Dhulian. The combined Burma-India output in 1939 was about 10,500,000 barrels. Since the start of the war a military pipe line laid across India facilitates the movement of Middle East oil to the fronts.

Meanwhile the move to release the Japanese hold on the oil producing areas of the Dutch East Indies began early in May with the capture by Australian and Dutch troops of Tarakan in Dutch Borneo where the Japanese claimed a year ago that they had eighty wells in operation. The operation in Borneo is looked upon as the initial move in a campaign that will be carried presently to Java and Sumatra.

The early days of May also witnessed the beginning of systematic bombing attacks upon oil refineries and storage installations in the Japanese homeland. With the reenforcement of the Pacific air arm by many squadrons transferred from Europe saturation bombing is being carried out on a large scale and the same methods that led to the almost complete drying up of Germany's oil supply, the neutralization of the Nazi air force and the partial immobilization of their mechanized field equipment are being employed with full intensity against Japan.



ECHOES FROM THE WASHINGTON OIL FRONT

By W. J. Maddox, Chief of World Petroleum's Washington Bureau

C. Stribling Snodgrass

Erwin C. Hannum

V-E Brings Changes to PAW

C. STRIBLING SNODGRASS, director of the Foreign Refining Division has been appointed chairman of the Foreign Operating Committee and also vice-chairman of the Foreign Petroleum Committee, under Deputy Administrator Davies. While retaining his position as division head, Snodgrass succeeds W. D. Crampton, recently resigned, to the committee positions. The Foreign Petroleum Committee is composed of representatives of the War, Navy and State Departments, the War Production Board, the War Shipping Administration, the Foreign Economics Administration, the Office of Coordinator of Inter-American Affairs and the British Petroleum Board.

The newly created office of executive assistant to the chairman of the Foreign Operating Committee has been assigned to Erwin C. Hannum, formerly of the Bureau of the Budget. He will handle problems affecting all three of PAW's foreign divisions and will assist in coordinating their activities with other PAW operations and with the work of other government agencies concerned with petroleum. In addition Hannum's work will include the duties of executive secretary of the Foreign Operating Committee, from which Howard L. Freeman recently resigned to join the Oil Well Supply Company. While with the Budget Bureau, Hannum was closely connected with the review of PAW operations, and became thoroughly familiar with PAW and related government agencies engaged in petroleum activities.

George Parkhurst

F. M. Jayne

George L. Parkhurst, of Chicago, has been advanced to the position of contract executive of the Refining Division, and F. M. Jayne, of Berkeley, Calif., to assistant division director in charge of economics and facilities. Parkhurst's job is a new one. He went with PAW in 1941 from Indiana Standard, where he was patent attorney, and became assistant director of the refining division. Jayne came to PAW in January 1943 from California Standard, where he was head analyst in the manufacturing department.

Revising Foreign Supply

Orville Harden

COLLAPSE of Germany has brought about changes in the operations of various official agencies and committees that have been charged with the supply of materials for purely military purposes. One major change is a step toward relieving the United Nations military forces of responsibility for supplying petroleum products for civilian needs in North Africa. Deputy Administrator Davies has asked Orville Harden, chairman of the Foreign Operations Committee of the oil industry, to appoint additional members to a subcommittee—the North Africa supply and distributions committee—and to revise its responsibilities so it can participate actively in supplying North Africa as soon as the military situation permits and as long as wartime product and transportation shortages exist.

The subcommittee of the Foreign Operations Committee has been in existence since 1944, but it has had advisory responsibility only. It now will deal with crude and products, except as otherwise provided by PAW's Foreign Supply and Distribution Division. It will compile data on authorized supply programs and help arrange transportation of products in accordance with such programs.

Pew Receives Hanlon Award

THE Hanlon Award, highest honor in the natural gasoline industry has been conferred on James E. Pew, director, Natural Gas-Natural Gasoline division, Petroleum Administration for War. Mr. Pew is the ninth recipient of the award which is conferred each year by the N. G. A. A. for outstanding meritorious service to the natural gasoline and condensate industries.

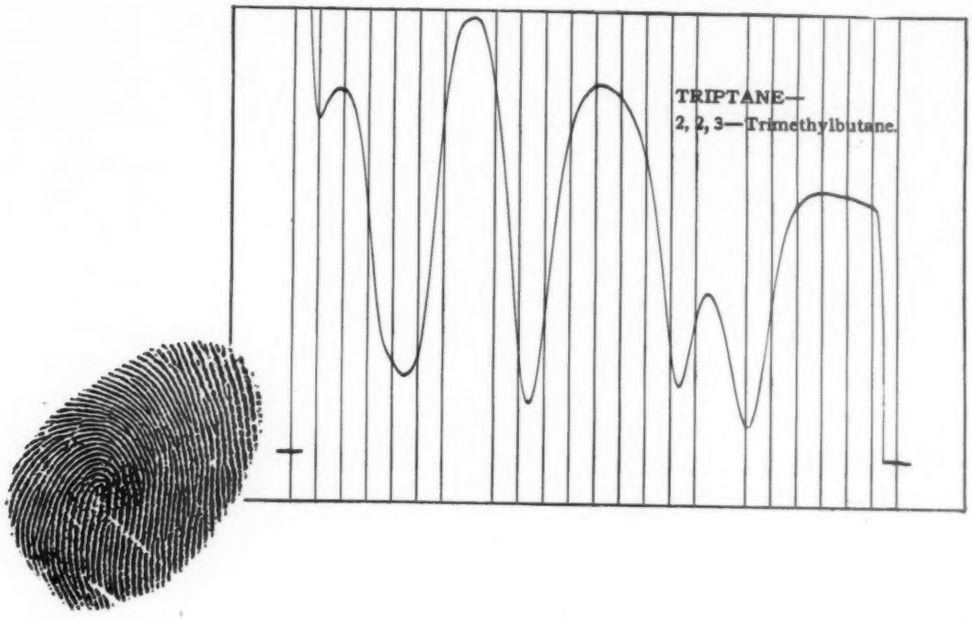
Presentation was made by James W. Vaiden, Skelly Oil Co., N. G. A. A. President, at the luncheon for the Directors. The citation read in part: ". . . . . his untiring efforts in coordinating the war-time activities of the natural gasoline and condensate industries with those of the entire oil program; his continued and forceful advocacy of a broader use of the products of the industries in the manufacture of critically needed war materials; and the effective manner in which he stimulated and directed the production and distribution of products for which there was the most pressing need, not only resulted in a great contribution to the total war effort but brought a new realization to the industries he represented of their own potentialities."

Johnson Accepts Judgeship

Jed Johnson

ANOTHER member of the House who has been conspicuous in oil affairs on the Hill, Jed Johnson of Oklahoma, has left politics to take a place on the United States Customs Court in New York City. Preceding him to the nine-man court was Representative William P. Cole, Jr., of Maryland, who as chairman of the Cole Oil Investigating Committee gathered what is probably the most comprehensive fund of information on the oil industry ever assembled by any Congressional committee. Johnson served on the House Appropriations Committee for years and was chairman of the subcommittee on Interior Department appropriations, which brought him in frequent contact — some-times none too amicable — with Secretary Ickes. In paring down the currently pending Interior appropriations bill for 1946, Johnson had his last fling at the Secretary. Ickes wanted a million dollars for oil exploration in Alaska; the subcommittee said "no". He wanted 13 million for the Bureau of Mines' synthetic liquid fuels plants; the subcommittee allowed him six. He asked for an additional Assistant Secretary of Interior, and got another "no". In the report to the House on the appropriation bill Johnson handled Mr. Ickes, as an administrator, rather roughly.

(*Continued on page* 90)



FINGER PRINT OF A HYDROCARBON

The infra-red spectrogram is to a trained scientist as a finger print is to the F.B.I. —the index of identification.

The UOP infra-red spectrometer "finger prints" hydrocarbons—a valuable aid to our technologists in analyzing hydrocarbon mixtures.

CATALYTIC CRACKING	*THERMAL CRACKING*	*RETREATING*
CATALYTIC REFORMING	*THERMAL REFORMING*	*POLYTREATING*
HYDROGENATION	*HYDROFORMING*	*U. O. P. CATALYSTS*
ALKYLATION	*DEHYDROGENATION*	*UNISOL TREATING*
ISOMERIZATION	*POLYMERIZATION*	*U. O. P. INHIBITORS*

Universal Oil Products Co.
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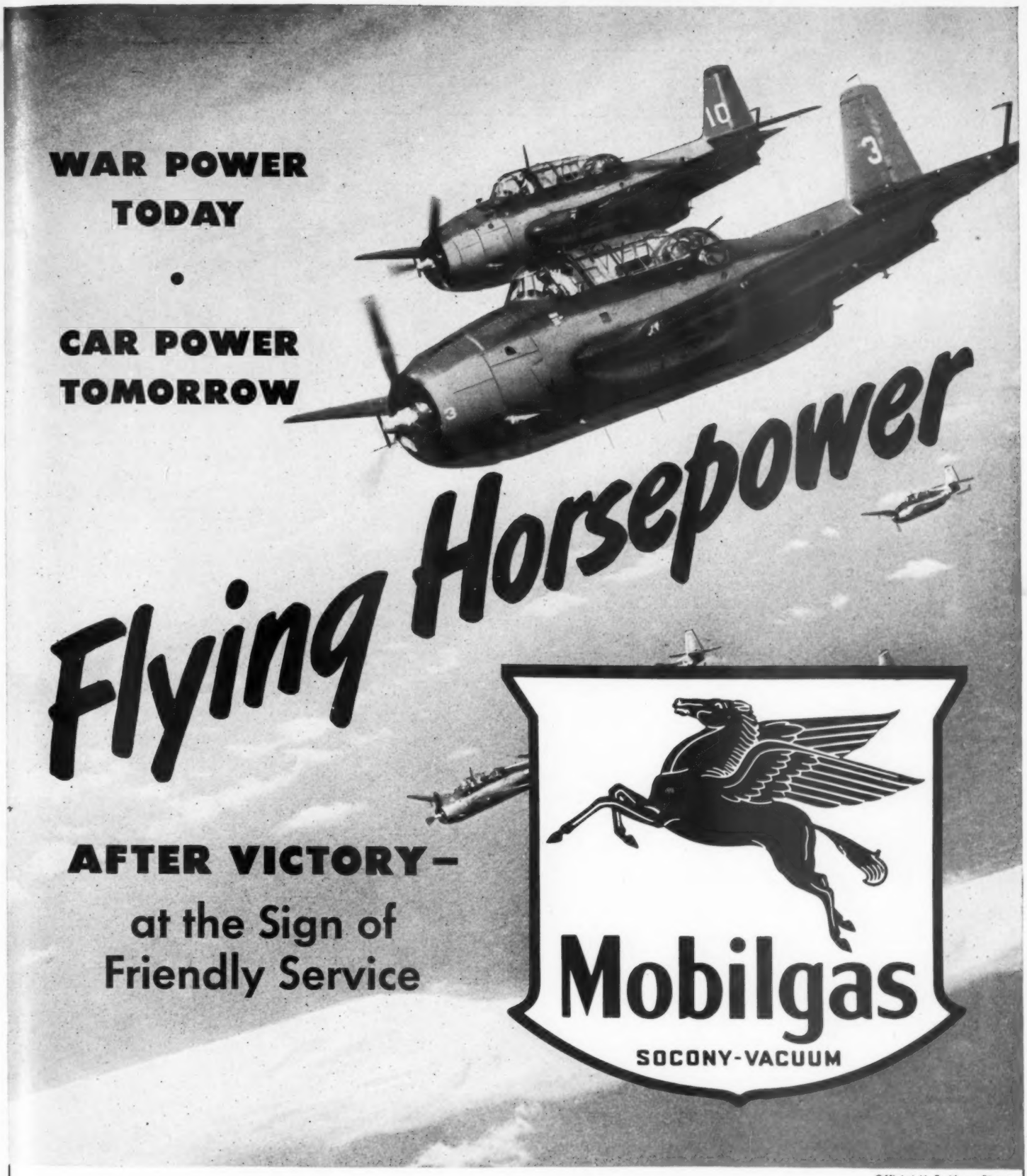

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Socony-Vacuum Oil Company, Inc.

26 Broadway, New York 4, N. Y.; and Affiliates: Magnolia Petroleum Co., Dallas; General Petroleum Corp. of Calif., Los Angeles

Mobilgas • Mobiloil • Mobilubrication • Mobil Specialties

Oil Company Staff Changes

M. G. Cheney

W. F. Mitchell

M. G. CHENEY of Coleman, Texas, president of Anzac Oil Company, was elected president of the American Association of Petroleum Geologists at the annual meeting of the society held in Tulsa. Other officers for the year are Gordon Gulley, Gulf Oil Corporation, vice president; Edgar A. Koester, Wichita, Kas., secretary-treasurer, and Gayle Scott, professor of geology at Texas Christian University, editor. The Sidney Powers memorial award was presented to Wallace E. Pratt, director of Standard Oil Company (N. J.) in recognition of his outstanding contributions to petroleum geology and the annual President's award went to William E. Wallace of Shreveport, La.

IN connection with the expanding operations of Shell interests in Western Canada announcement is made by P. M. Fowlie, president of Shell Oil Co. of Canada, Ltd., of the appointment of N. Y. Knox as vice president and general manager of Shell Oil Co. of British Columbia, with headquarters at Vancouver. Mr. Knox served for several years in various departments of Shell in the United States. He joined the Canadian company in 1933 and has been vice president and general sales manager since 1935. Succeeding to the post vacated by Mr. Knox is W. F. Mitchell, a graduate of Queen's University, who organized the company's technical products department in 1939 and has been operations manager since 1941.

J. H. DUNN, vice-president of Shamrock Oil and Gas Corporation, Amarillo, Texas, has been elected president of the Natural Gasoline Association of America for the current year. He succeeds James W. Vaiden, vice-president of Skelly Oil Company, who retired after serving two terms. Vice-presidents elected include Paul M. Raigorodsky, H. A. Ellis, John B. Atkins and C. R. Williams.

N. Y. Knox

J. H. Dunn

E. J. MUNDY, JR., has been elected secretary and assistant treasurer of the Creole Petroleum Corporation, succeeding W. S. Sollenberger who resigned to accept an appointment in the producing department of Standard Oil Company (N. J.) Mr. Mundy has been associated with the petroleum industry for 25 years, having joined the Standard Oil Company of New Jersey in 1920 as a file clerk in its foreign sales department in New York. Six years later he entered the company's coordination department where he remained until transferred to the producing department in 1943. He joined Creole on July 1, 1944, as statistician and budget analyst. He has been secretary of the producing sub-committee of the Caribbean Area Petroleum Committee of the Petroleum Administration for War since early in 1943.

Mr. Sollenberger joined the Jersey company interests in 1926 in Mexico City where he was employed by the Cia. Transcontinental de Petroleo, S. A. Subsequently he became vice president of the Huasteca Petroleum Company. He remained in Mexico until elected secretary of Creole in 1944.

J. HOWARD MARSHALL, president of Ashland Oil and Refining Company, has announced the appointment of H. C. Arnold, who has been a vice president of the British-American Oil Producing Company since 1938, as vice president of the Ashland Oil & Refining Company in charge of oil and gas exploration with headquarters in Tulsa, Oklahoma.

H. G. SCHAD, director and general manager of transportation of the Atlantic Refining Company, has been elected a vice president of the company. Mr. Schad joined Atlantic as assistant to the general manager of transportation in 1925, and was made general manager in October, 1941. He is a vice president and director of the Keystone Pipe Line Company and the Buffalo Pipe Line Corporation, and a director of the Atlantic Pipe Line Company, all subsidiaries of Atlantic Refining. He is also a director of War Emergency Tankers, Inc.

A. H. DeFRIEST of General Petroleum Corporation, Los Angeles, has been appointed assistant to president B. Brewster Jennings of the Socony-Vacuum Oil Company. Mr. DeFriest joined the company in 1919 shortly after his graduation from Colgate University. After several years in the Orient, he went to Los Angeles, in 1929, as a salesman for General Petroleum. He has been vice-president of the General Petroleum Corporation since 1934 and a director since 1938.

(*Continued on page* 88)

3. BENDING Both the hot and cold methods of bending the 24-inch pipe proved successful. In each instance a tractor holds a bending block firmly at the point where the bend is desired and a second tractor pulls the end of the pipe to obtain the correct curvature.

4. TACK WELDING another joint in the line. Records were made for laying 24-inch pipe; as many as 8 miles were laid by the contractors on certain days.

THEY designed the "Big Inch" to deliver 300,000 barrels of oil a day—but the big pipe line did better than that. Often it would push as much as 30,000 extra barrels a day into East Coast receiving tanks. Every barrel of this oil contributed to final Victory in Europe.

Today, the "Big Inch" is still delivering oil to the East permitting more and more tankers to be used for the long haul over the Pacific.

In the operation of the "Big Inch" line, one factor stands out—*the complete reliability of* NATIONAL *Seamless Pipe.* A total of 1,117 miles of 24-inch NATIONAL Seamless was used in the main part of the line and every length has withstood the high pressure *without trouble.*

The engineers, pipe makers and "pipeliners" who worked on the "Big Inch" can look back on a job well done. Their names may not appear in the headlines, but what they have done will go down in the records as an all-important contribution in paving the way to Victory!

5. READY FOR COATING AND DITCHING with all bending and welding completed. Experience in the field showed that even such large pipe was well suited to customary construction procedures.

6. RIVER CROSSINGS were generally made by tractors pulling pipe into the river as each joint was welded on. Line was floated until ready to lower. Dredges then sucked sand from beneath the pipe and allowed it to settle 4 to 5 feet below the river's bed.

NATIONAL TUBE COMPANY
PITTSBURGH, PA.
United States Steel Export Company, New York

NATIONAL SEAMLESS

WALLS WITHOUT WELDS

WORLD PETROLEUM ABSTRACTS

Summaries of the Most Important Articles as Published in the Oil Press of the World Dealing with Technical and Economic Aspects of the Petroleum Industry—Edited by Dr. O. W. Willcox.

DRILLING

Oil Base Drilling Fluids Often Boost Production.—A. W. Alexander, in OIL WEEKLY, Vol. 115 (1944) No. 1, pp. 36, 38, 40.

The author first lists the characteristics of a good drilling fluid; it should be readily handled by the circulating pumps; it must be able to carry the cuttings to the mud screen at the surface; it should have thixotropic properties (fluid while circulating, gelatinous when drilling is interrupted); it should have good plastering properties to form a thin and nearly impervious cake on the walls of the hole; the cake so formed should be easily dislodged from the walls by washing or scraping, so that fluids from the formation may flow into the well; and, finally, the fluid should allow a good electric log to be taken of the borehole.

Water that has been loaded with clay and other materials is the principal constituent of oil-well drilling fluids, and there is no known material that, when dispersed in oil, will have all the properties of a clay-water suspension, but there are a number of situations in which water as a drilling fluid base has certain disvantages. To meet such situations use is being made of oil as the fluid base. In compounding such a base use must be made of weighting materials that will give a required density to the fluid; a gel-forming agent must be added to provide a gel structure to retain the solid materials (cuttings) in suspension, and a proper plastering agent that will form a thin but substantially impervious sheath on the walls of the borehole and prevent the escape of the drilling fluid into the formations traversed by the hole.

Either crude oil or distillates with gravities between 20° and 40° API may be used as the oil base. Calcium carbonate (limestone or oyster shell), ground to pass 85 percent through a 200 mesh screen may be used as the weighting material. As calcium carbonate has a relatively low specific gravity (2.6) barites or iron oxide may be added to give weight; thus, oil-base muds weighing up to 17 pounds per cubic foot may be prepared.

In order to prevent the weighting material from settling out, a sedimentation-inhibiter must be added. Lampblack has been successfully used or use may be made of alkaline soaps made from fatty acids that have two or more double bonds in their molecule, such as linolic or linoleic acids. One of the most satisfactory agents to give plastering properties is blown or oxidized asphalt (penetration 10-20 at 77° F., melting point (ring and ball) from 225° to 230° F.). However, the use of asphalt might be dispensed with by using more of the soaps of highly unsaturated acids.

The author relates the experience of the Shell Oil Company in the use of oil-base muds in California and Venezuela. In general, there are no important differences in the mechanical aspects of oil and water base muds. Most of the common types of cement jobs have been satisfactorily performed with oil-base muds. However, as oil-base muds are non-conductors of electricity it is inadvisable to use them where there are complicated structures or water problems requiring good electric logs for proper handling.

As to effect upon productivity, it has turned out that in some pools higher initial productivity, or higher productivity index, has resulted from the use of oil-base mud than has been obtained with water muds. In other cases no difference in productivity indices have been observed.

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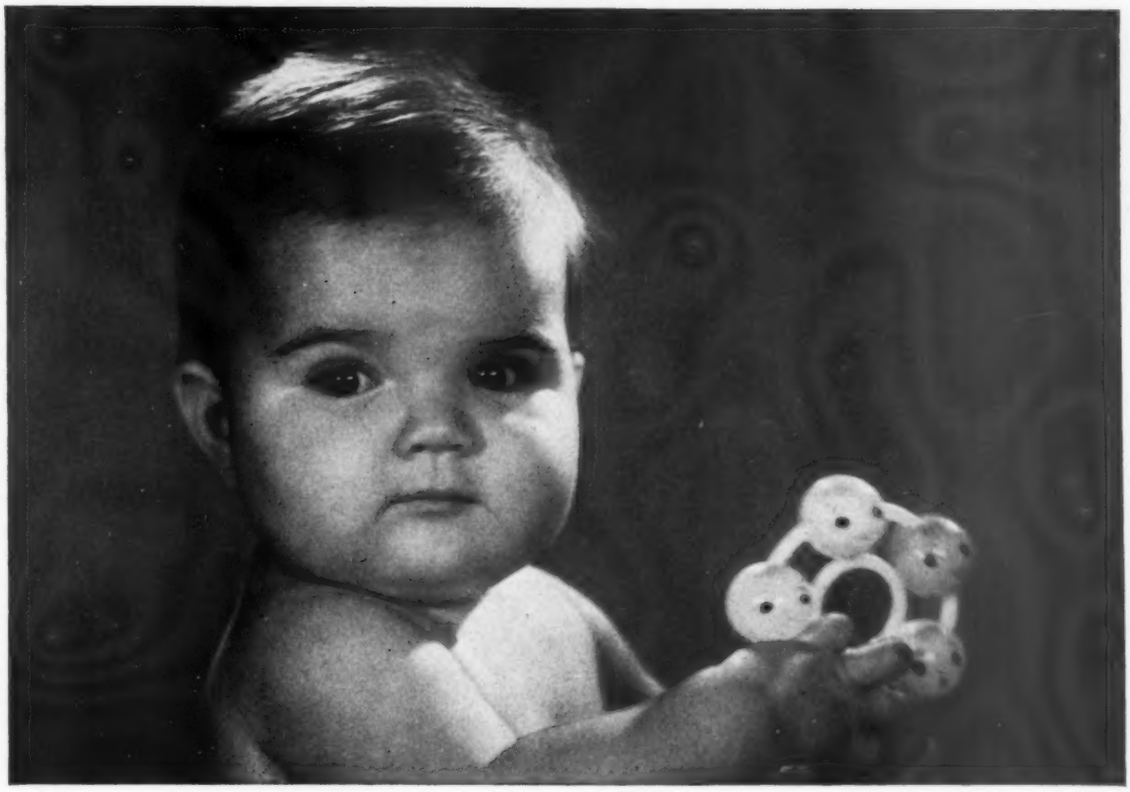

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By what you put aside in War Bonds *today* you can help *make sure* he gets the same chance as other boys, *tomorrow.*

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For every three dollars you invest today, you get *four dollars back when your Bonds come due.* You, and your boy, can use those extra dollars.

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REFINING

Failure of 18Cr-8Ni Cracking Still Tubes—C. L. Clark and J. W. Freeman, before AMERICAN SOCIETY FOR METALS, Cleveland, October 1944.

The austenitic 18 CR-8 Ni steel has found wide use in the petroleum industry during the past 10 to 15 years as cracking still tubes in those units where the corrosion has been very severe, due to the processing of the so-called sour crudes. In general, the performance of this steel has been satisfactory and many of the original tubes are still in service after operating time periods up to 100,000 hours (11.4 years). In general, the temperature of the tubes in these installations has been held to a maximum of 1200 to 1250° F.

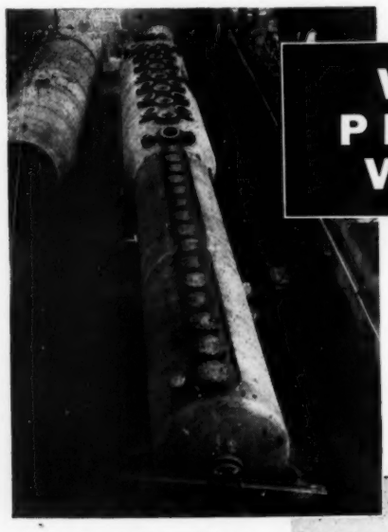
However, during this time period, certain of these tubes have actually failed while others have undergone rather pronounced changes in their physical properties. Through the cooperation of certain petroleum companies, cracking still tubes of 18 Cr-8 Ni were obtained which had been in service for time periods ranging from 35,000 to 97,500 hours. Certain of these tubes had actually failed in service, some were still ductile, others were brittle but could be rejuvenated, while still others were permanently embrittled.

This material was subjected to an extensive engineering laboratory study. On the basis of the result obtained from this study, it is believed that the deterioration, and possible actual failure of 18 Cr.-8 Ni cracking still tubes in service is due to structural changes at the grain boundaries which are progressive in nature and are dependent on time, temperature and stress. These structural changes consist first of the precipitation and growth of highly alloyed ferrite due to the decomposition of austenite.

When these precipitated areas have grown to a certain size, cracking, at first nearly submicroscopic in nature, will occur under certain conditions of time, temperature and stress. When this cracking has accurred the tube is permanently brittle but at any time prior to the cracking the tube is either ductile or can have its ductility restored.

The best available means for determining if 18 Cr-8 Ni steel has undergone changes in its physical characteristics after prolonged service at temperatures of 1200° to 1250° F. are the flattering test and a microscopic examination; chemical composition, visual examination, Strauss corrosion test, and tensile properties do not differentiate much between these tubes.

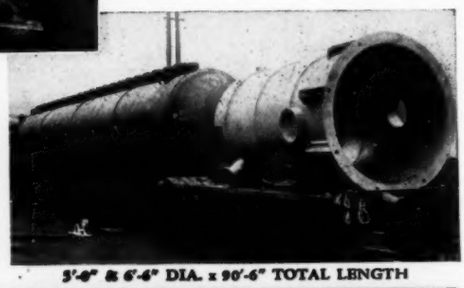
So long as what are apparently microscopic cracks do not form around the precipitated grain boundary particles ductility can be restored by rejuvenating treatments at 1500° and 1900° F. The beneficial effect of the 1500° F. rejuvenation heat treatment is believed due to the elimination of stress and to a possible transformation of the precipitated ferrite. It has little influence on the precipitated carbides, as evidenced by the microscopic examination, and yet it imparted immunity to the Strauss corrosion test.



WELDED PRESSURE VESSELS

HYDROGEN PLANTS
as applied to
CRACKING OF PETROLEUM
HYDROGENATION
OIL SYNTHESIS

5'-0" & 6'-0" DIA. x 72'-0" TOTAL LENGTH



5'-0" & 6'-6" DIA. x 90'-6" TOTAL LENGTH

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8'-0" DIA. x 39'-6" LONG

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BOOK

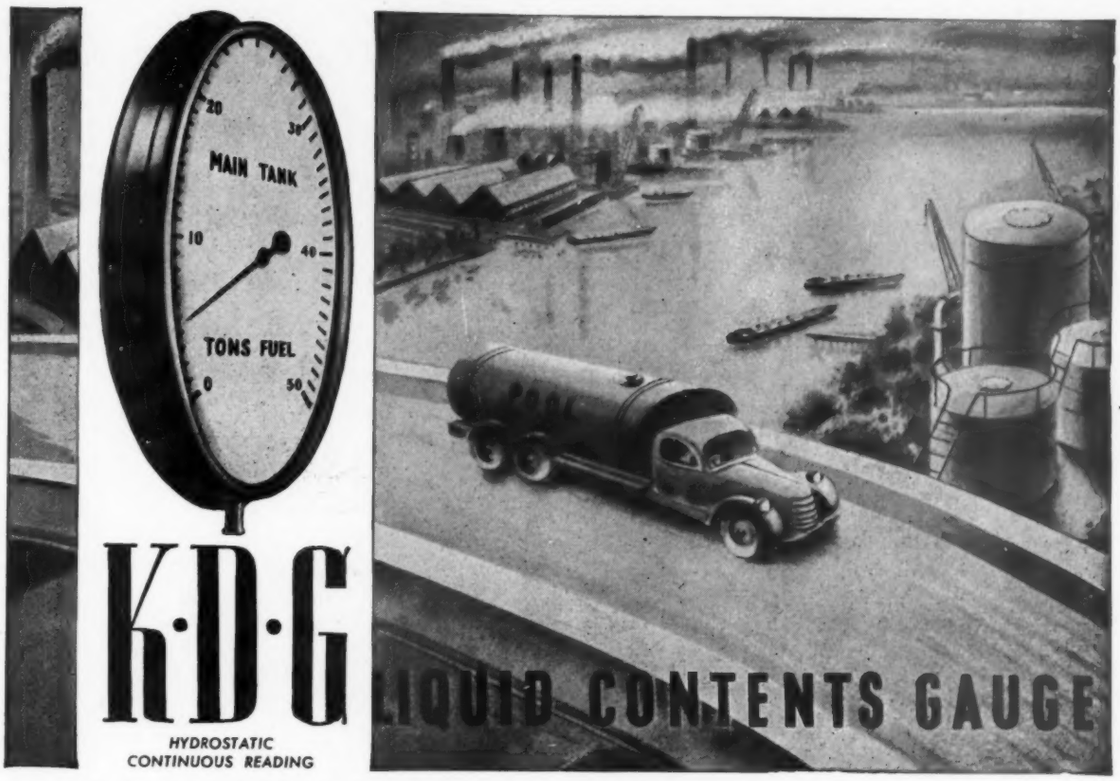
Manual on Refractory Materials; prepared by A. S. T. M. Committee C-8; Published 1944 by American Society Testing Materials, Philadelphia; 210 pages, Cloth $1.75.

The fifth revision of this manual includes new standards for setting refractory motors, fire clay refractories, methods of measuring the properties of fire clay plastic refractories, and for measuring thermal conductivity of insulating fire brick. The general field of refractories and their testing is, as usual, well covered. An important and informative feature of the book is a survey of the use and operations with refractories in in nine typical industries and stationary steam boiler plants.

PIPE LINES

A Universal Pressure Rectifying Column—By Edgar S. Byron, John R. Bowman and James Coull, before American Chemical Society, New York Meeting, September 1944.

Following an introductory review of high vacuum distillation in general, a new type of rectifying column is described. This column, in contrast to all countercurrent contactor types, employs the principle of "multiple redistillation" previously described. (R. M. Schaffner, J. R. Bowman, and James Coull, Trans. Am. Inst. Chem. Engrs. 39, 77 (1943)), but differs in being applicable at all pressures. Basically, it comprises two concentric tubes. Heat is applied uniformly throughout the length of the outer one, and the reflux stream, which flows down its inner surface, is continuously vaporized. Vapor rises in the annular space between the two tubes. The inner tube is uniformly cooled throughout its length, and rotated at such a speed that the condensate formed on it from the vapor is thrown off centifugally to join the reflux stream. The theory of the performance of such a column is developed in detail, and experimental results are presented showing fair agreement with the ideal predictions. In addition to operation at all pressures, especially high vacuum, these columns have the advantages of very low holdup, being virtually floodproof, and requiring low reflux ratio.



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BRANCHES AND AGENCIES THROUGHOUT THE WORLD

GENERAL

Sources, Disposition and Characteristics of the Capital Employed by Thirty Oil Companies in 1934-42—Joseph E. Pogue and Frederick G. Cogeron, before PETROLEUM DIVISION, AMERICAN INSTITUTE MINING AND METALLURGICAL ENGINEERS, New York, February, 1944, 37 pages.

This study presents the results of a detailed survey of the financial and operating aspects of thirty American oil companies that in 1942 produced 54 percent and refined 79 percent of the totals for the whole country. Eighteen companies accounted for half of the nation's crude production, and seven companies for half of its refinery throughput. The extensive data serve for a number of broad generalizations, some of which are summarized as follows:

The petroleum industry generates the capital needed for its expansion almost entirely from its own operations and is therefore a singularly self-contained economic unit.

The long-term debt contained in the financial structure of the industry is small relative to the total capital and is less than the net working capital.

The capital expenditures of the group of 30 oil companies for nine years amounted to 6.1 billion dollars, 58.3 percent of which went into crude oil producing facilities. The trend of this segment of expenditures has been downward since 1937.

The net working capital of the group increased 380 million dollars over the period, and the industry is in favorable position of liquidity. The ratio of combined current assets to current liabilities was 3.21 at the close of the period.

The group has paid out a relatively low percentage of net income in the form of dividends. For the period the average was 55 percent of net income.

The rate of return on invested capital for the group averaged 6.4 percent for the period, compared with an average of 8.8 percent for a group of over 1,000 manufacturing companies. Integrated oil companies showed a lower rate of return than producing companies.

Combined net assets for the group totaled over 6 billion dollars at end of 1942, of which 700 million dollars, or 12 percent, were located outside the United States.

The combined net investment in properties, plant, and equipment of the group at December 31, 1942, was distributed in the divisions of the business as follows: production, 45.6 percent; transportation, 13.7 percent; refining, 19.8 percent; marketing, 18.7 percent; and all other, 2.2 percent.

The combined results for the group indicate a declining trend since 1937 in the capital expenditures per barrel of crude oil produced.

The group increased its crude oil production by 57 percent and its refining throughput by 43 percent between 1934 and 1942, as compared with an expansion of 25 percent in gross fixed assets, 19 percent in fixed assets, and 11 percent in borrowed and invested capital.

REFINING

Production of Isoparaffin Hydrocarbons by Cracking Petroleum Fractions in the Presence of Aluminum Chloride.—W. P. Komarewsky and Lee Warson, before American Chemical Society, Division of Petroleum Chemistry, New York, September, 1944.

The cracking of gas oils, naphthas, and selected fractions of straight-run products was studied under various conditions of aluminum chloride and hydrogen chloride. The main results obtained in the course of this work were: A. The gasoline obtained as the result of aluminum chloride cracking of straight-run distillates yield an 80-octane product with good tetraethyl lead susceptibility. B. The products were composed mainly of isoparaffin hydrocarbons. C. Similar products were obtained from charging stocks of various origin. D. The cracking reaction could be directed, so that a product with desired end point would result. E. Isobutane (34% by volume) and isopentane (29% by volume) were obtained, based upon the charges. F. The mechanism of the reactions was discussed.

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Westinghouse Fills Export Posts

APPONITMENTS of Patrick W. Cross as manager of the Sao Paulo office of Westinghouse Company of Brazil and of W. W. Parker as regional engineer in the Rio de Janeiro office have been announced by Westinghouse International.

Mr. Cross, who is a graduate of the Virginia Polytechnic Institute, entered the Westinghouse student course in 1934 after a year with the Newport News Shipbuilding and Drydock Company. Following several years of service he went to Venezuela in 1941 for C. A. Armco Venezolana, the Westinghouse distributor for the petroleum industry. In his present position he will serve as regional engineer of Sao Paulo area as well as manager of the Sao Paulo office.

Mr. Parker joined Westinghouse as a member of the student engineering course upon his graduation from Yale Sheffield Scientific School in 1927 and was transferred to the switchgear division the following year, specializing in the design and operation of a-c network calculators. In his new position, as regional engineer, he will render technical assistance to Westinghouse distributors and customers.

Cassidy Heads Agency Groups

H. E. CASSIDY, Los Angeles advertising executive, has been elected chairman of the Pacific Counsel of the American Association of Advertising Agencies. Mr. Cassidy is vice president of The McCarty Company and has been active in the Pacific Coast advertising field for the past seventeen years. He is particularly interested at present in extending to other cities the recently established advertising technical training program which in Los Angeles has been sponsored by the local 4-A chapter and the University of California. Such a course, he believes, will appeal to returning service men and open the way for those with natural qualifications to enter the advertising field.

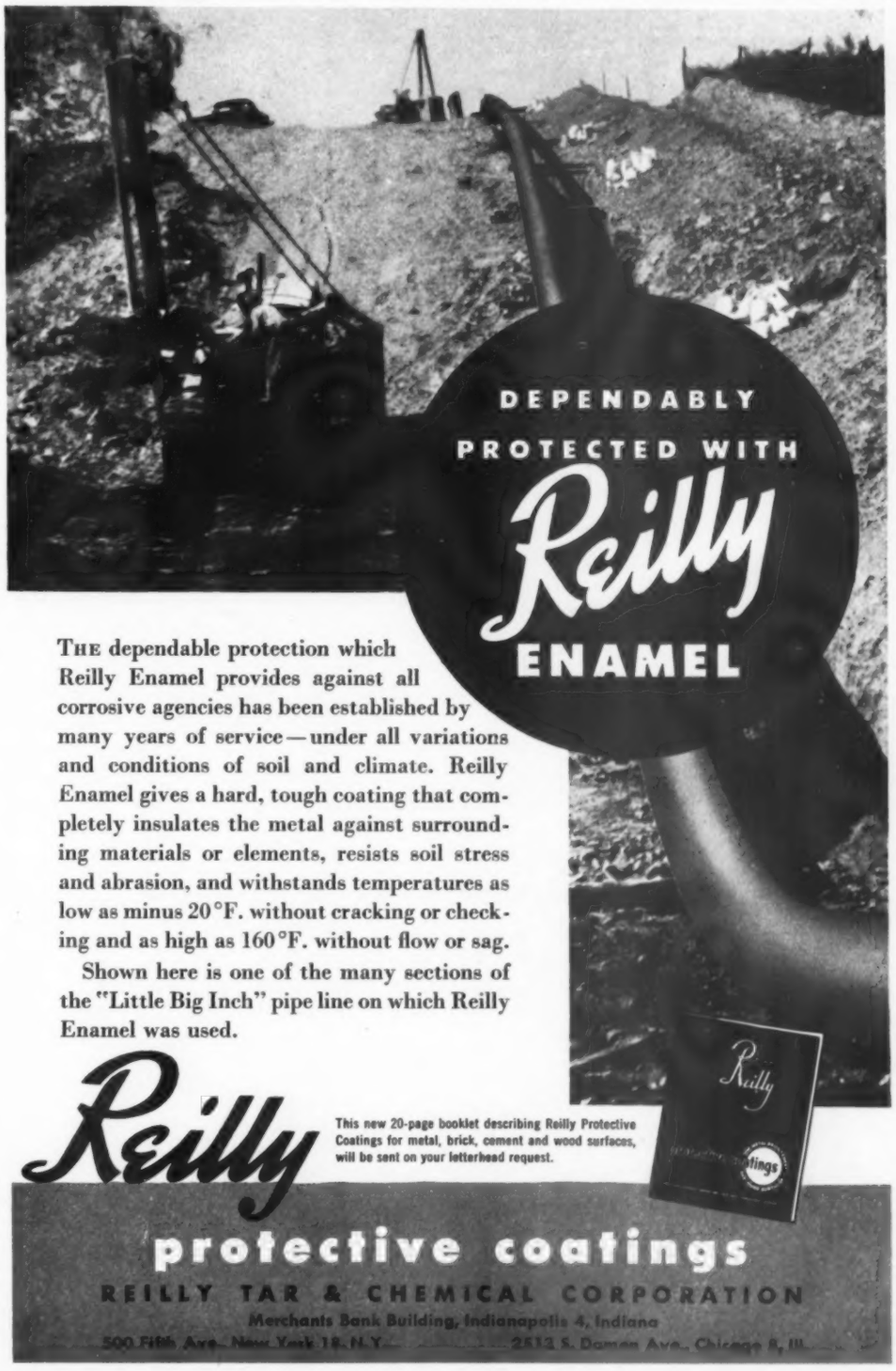
Montrose Heads Marion Shovel

M. E. MONTROSE, who recently resigned as vice-president and manager of sales for Lane-Wells Company, has been elected president, general manager and a director of the Marion Steam Shovel Company of Marion, Ohio. The company is one of the largest manufacturers of steam shovels and mining equipment in the world. Mr. Montrose is widely known in the oil industry through his connection with Lane-Wells during the past ten years. Prior to that time he was with General Electric Company.

Humble Tests Florida Well

HUMBLE No. 4 Sunniland well in Collier County, which is 8000 feet north of the Humble discovery well, Gulf Coast Realties No. 1, in Collier County, Florida, found pin-point porosity in limestone from 11,559 feet to 11,582 feet and good porosity from 11,588 feet to the total depth of 11,597 feet. A drill-stem test was made from 11,549 feet to 11,597 feet, using 6,000 feet of water cushion. A 3/8-inch top choke and 1/4-inch bottom choke were used in the tool, which was open for one hour and 26 minutes. The recovery consisted of the water cushion plus 5990 feet of 19.2 corrected gravity oil, 10 feet of salt water, and 30 feet of salty, oil-cut mud. The average bottom hole flowing pressure was 5225 pounds.

The present total depth of 11,597 feet is 27 feet above the water level as indicated in the discovery well, and, based on this information, it appears to be a better well. An accurate estimate of the producing capacity, however, cannot be made until the casing has been set and actual tests made.



THE dependable protection which Reilly Enamel provides against all corrosive agencies has been established by many years of service—under all variations and conditions of soil and climate. Reilly Enamel gives a hard, tough coating that completely insulates the metal against surrounding materials or elements, resists soil stress and abrasion, and withstands temperatures as low as minus 20°F. without cracking or checking and as high as 160°F. without flow or sag.

Shown here is one of the many sections of the "Little Big Inch" pipe line on which Reilly Enamel was used.

Reilly protective coatings

This new 20-page booklet describing Reilly Protective Coatings for metal, brick, cement and wood surfaces, will be sent on your letterhead request.

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California Companies Unite

TWO prominent Pacific Coast oil companies, Gilmore Oil Company and General Petroleum Corporation, have consolidated into one organization, continuing under the name and management of General Petroleum Corporation. Clarence S. Beesemyer, who worked with Earl Gilmore in the development of Gilmore Oil Company practically from its inception, and who has been president of that company since retirement of Mr. Gilmore in 1944, has been elected to the directorate of General Petroleum Corporation. John C. Sample, for a long time general sales manager of General Petroleum, has likewise been elected a Director. Naming of General's C. H. Wartman and Gilmore's H. Alber as assistant general sales managers, and W. J. (Jerry) Hawkins, of Gilmore, as assistant to the general sales manager, are among other appointments first announced.

Henceforth, with one exception, all west coast marketing will be under the direction of General Petroleum. The exception is a newly formed subsidiary, The Gilmore Asphalt and Road Oil Company, of which W. G. Julier is vice president and sales manager. The independent service station dealers of both companies, of which there are many thousands, will be served by General Petroleum with its well known brands.

Both companies were founded by picturesque characters. A. F. Gilmore, founder of Gilmore Oil Company, was a rancher. He arrived in Southern California in 1880, selected 256 acres of land near what is now the intersection of Third & Fairfax Street, Los Angeles, and began the business of conducting a successful dairy ranch. His interest in oil developed from a visit to the celebrated La Brea Pits, where black gold then bubbled and still bubbles from the earth. He started drilling for oil, striking it on the third attempt, and bringing in a field of 24 producers. First marketing kerosene and burner oil, he turned to selling gasoline when motoring became popular. It was then that his son, Earl Gilmore, and Clarence S. Beesemyer, joined the organization, learned the business step by step, finally creating one of the most popular oil companies on the Pacific Coast, with thousands of alert dealers handling their products.

Also colorful, but operating originally in a different field of endeavor, was Captain John Barneson, a veteran of the sea lanes and originator of oil burning in steamships. He was the founder of the Esperanza Oil Company in 1910, which was changed to General Petroleum Company in 1912, and thereafter developed in spectacular growth to its present status as General Petroleum Corporation. Captain Barneson held the distinction of having built the first pipeline over the Tehachapi Mountains, thus bringing oil from its San Joaquin Valley sources through Los Angeles to the Torrance and San Pedro areas. A new 10-inch pipeline was put over the mountains from Lebec to Torrance in 1935, to meet expanding needs of General refineries.

During 1944 General Petroleum properties in California and Wyoming produced a total of 19,000,000 barrels of crude oil, while its refineries were heavily expanded. Several years ago a new refinery site of over 300 acres was acquired at Torrance, and here has been erected a multi-million dollar refinery. It is one of the largest in the industry, and is turning out huge quantities of super 100-octane gasoline for the armed services, using TCC and bead process developed by Socony-Vacuum. Combined assets of Gilmore and General Petroleum are placed at approximately $105,000,000.

Gardner-Denver Director

ALFRED KAUFFMAN former president of Link-Belt Company has been elected to the directorate of Gardner-Denver Company. He succeeds P. H. Gardner who resigned because of ill health. Mr. Kauffman also serves as a director of Link-Belt, LaPlant Choate Mfg Co. and Cardox Company.

Alfred Kauffman

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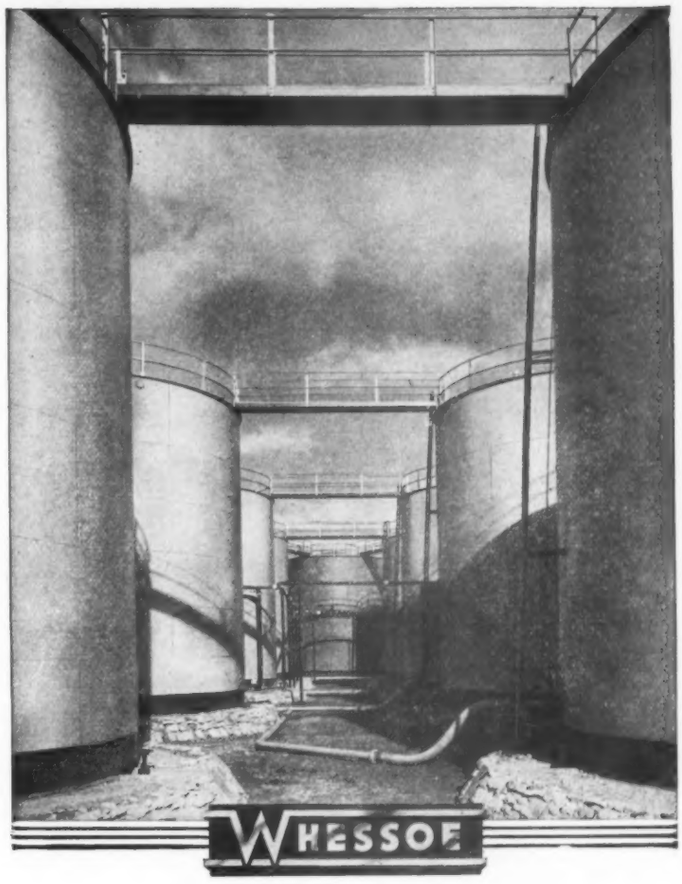

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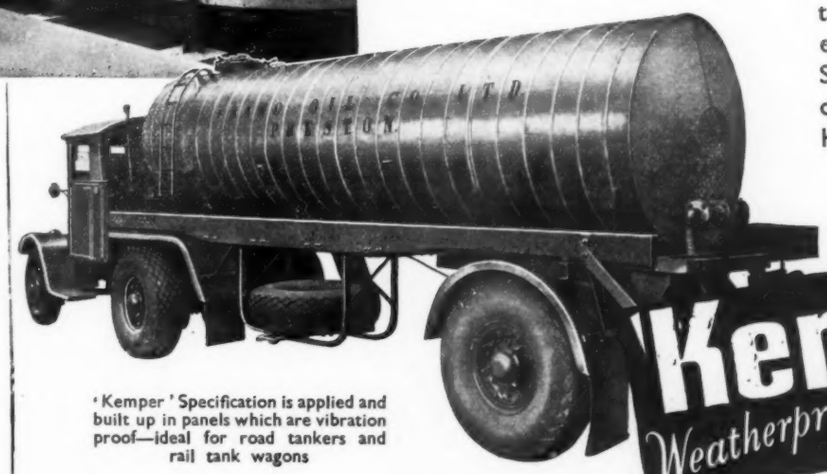

'Kemper' Specification is applied and built up in panels which are vibration proof—ideal for road tankers and rail tank wagons

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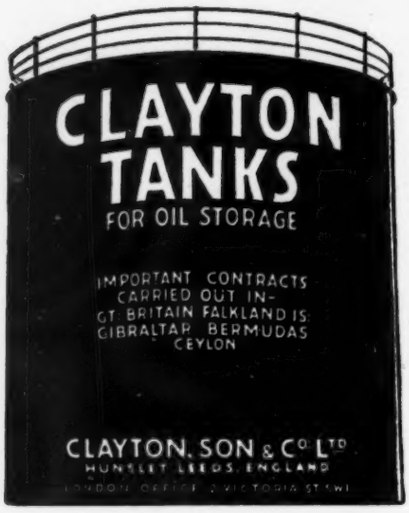

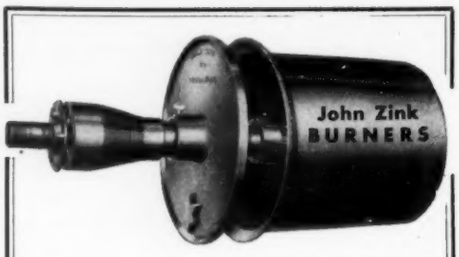

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Oil Company Staff Changes

(*Continued from page 64*)

ROBERT B. CRAGIN, vice-president in charge of commercial development of Houdry Process Corporation, has announced the appointment of Henry D. Noll as manager of the company's project analysis department. Mr. Noll brings with him nearly twenty years of experience in plant operation, technical service and petroleum research and development. During the earlier part of this period he worked for Magnolia Petroleum Company at Beaumont, Texas. Later he was transferred to the research and development laboratories of Socony-Vacuum at Paulsboro, N. J. Just prior to coming to Houdry he was in the manufacturing department of Socony-Vacuum in New York on special wartime assignments.

THE Legion of Merit for "pioneer work in large scale personnel administration" has been awarded Col. Walter C. Pew, the War Department announces. During the period of the Normandy invasion, he was deputy chief of POL (petroleum, oil, lubricants) on General Dwight D. Eisenhower's staff. Colonel Pew was general sales manager and a director of Sun Oil Company when he volunteered for duty with the U. S. Army in February, 1942. He was commissioned a Major.

In March, 1944, then a full Colonel, he headed a group of 54 hand-picked oil men who sailed for Europe to speed invasion planning. After the Germans were driven from Paris, Colonel Pew became American head of the petroleum section of the SHAEF Mission to France, which handles all the Allied armies' contacts with the French people and their government. The citation stated Colonel Pew's work "brought about a sound, well-organized personnel program for the Ordnance Department through the application of improved practices, resulting in better utilization of manpower and lower production costs."

Col. Walter C. Pew

Donald W. Stewart

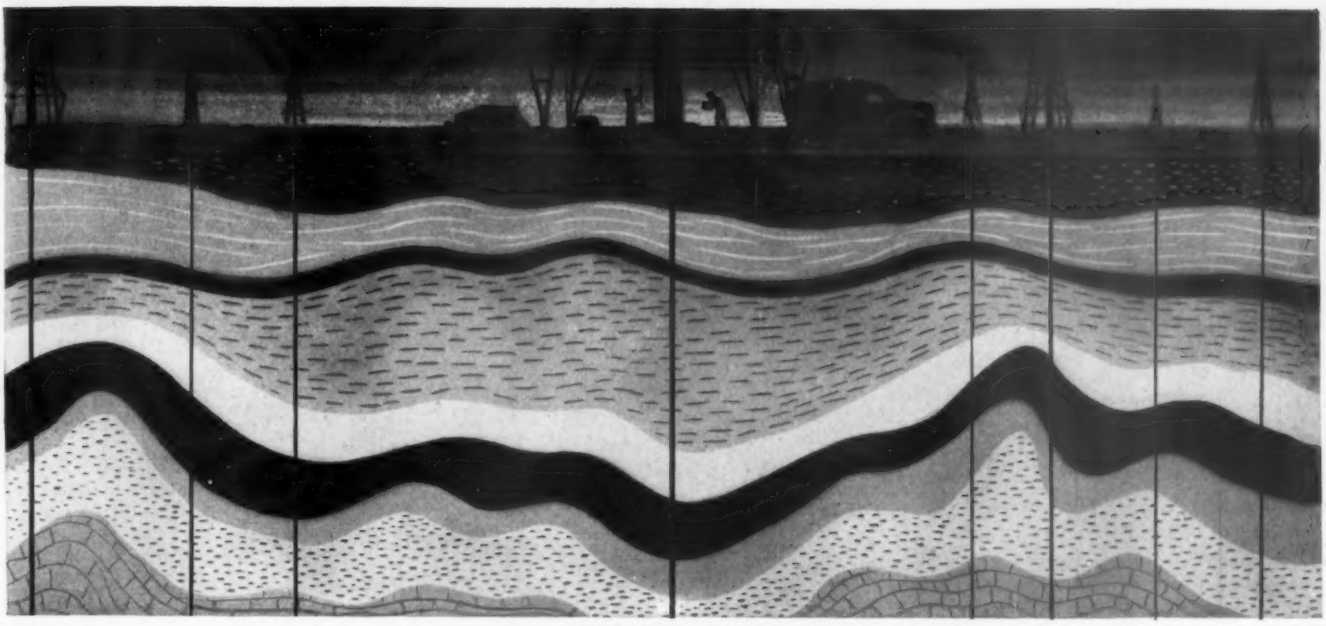
DONALD W. STEWART has been appointed manager of The Texas Company's advertising division to succeed the late Stephen M. Birch, according to an announcement made by H. W. Dodge, vice president and general sales manager.

Mr. Stewart has been assistant to the advertising manager for the past four and one-half years. He entered the service of The Texas Company in 1936.

H. C. AKERBERG, Atlantic Coast district manager of the Macmillan Petroleum Corporation, has been appointed general sales manager of the company's motor oil division. Mr. Akerberg, a native of Los Angeles, California, joined the Macmillan organization as a service station attendant in 1930, later becoming Los Angeles and San Francisco sales manager. He was successively Pacific Coast district manager and Kansas City district manager and he has been Atlantic Coast district manager since December 1943.

LELAND BRECKENRIDGE, accountant and tax consultant, has been added to the staff of the American Association of Oilwell Drilling Contractors. He was for some time connected with the Paul Rutledge and the late C. W. Boller interests, and is a well-known specialist in his field.

APPOINTMENT of Louis E. Whyte of Washington as supervisor of the educational department of the Independent Natural Gas Association has been announced by John A. Ferguson, executive director. Mr. Whyte comes to the Association with some fifteen years of experience in Washington with newspapers, trade journals and business information service organizations. He left the staff of the Bureau of National Affairs, an affiliate of the United States News organization, to accept the INGAA position.



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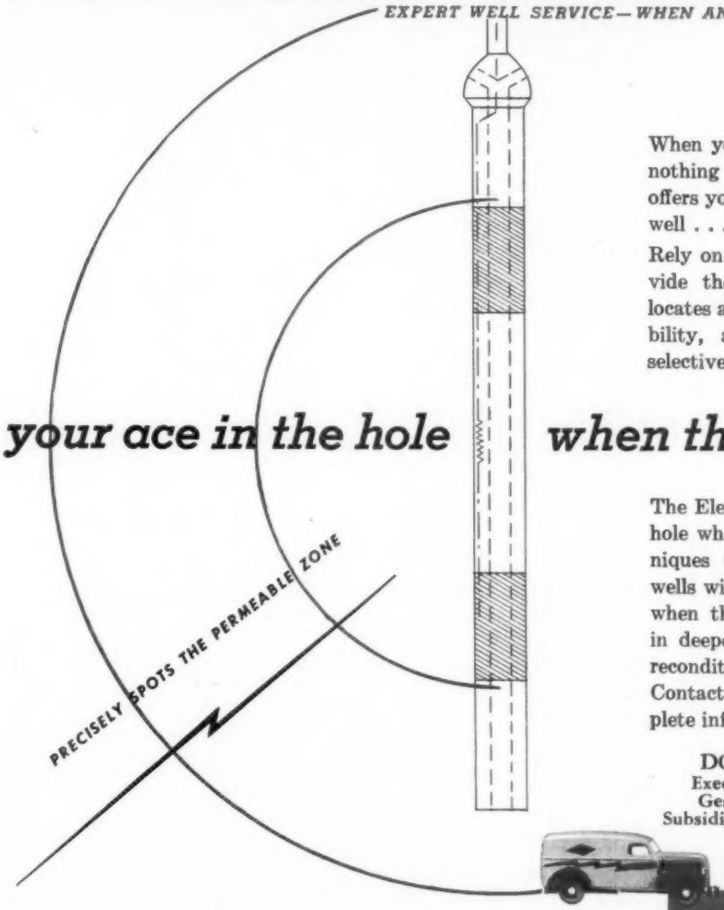

When you're already "in for plenty" and nothing but effective selective acidizing offers you the promise of a good producing well . . .

Rely on the Dowell Electric Pilot to provide the necessary data. It accurately locates and evaluates the zones of permeability, and makes control of required selective acidizing a certainty.

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The Electric Pilot is a valuable ace in the hole wherever conventional treating techniques are found to be inadequate—in wells with high gas-oil or water-oil ratios; when there are two or more pay zones; in deepened wells, and in various other reconditioning operations.

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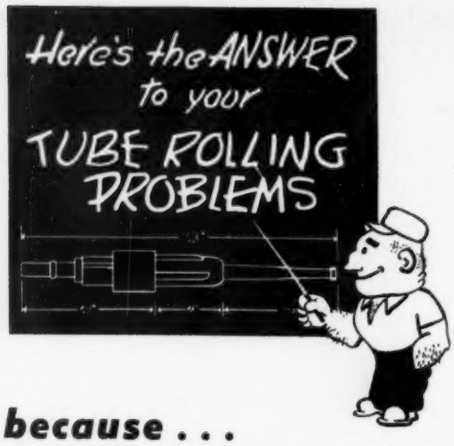

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Washington Oil Front

(*Continued from page 60*)

May Restrict Trade Pacts

IT would seem at this writing that the State Department might come off with something of authority to enter into reciprocal foreign trade agreements. The request was for a three-year extension and for broader powers than existed in the original authorization to reduce or raise tariffs and duties.

Former acts, beginning with the original one of 1934, allowed changes of duties up to fifty percent. The extension resolution as submitted to Congress now proposes to retain this fifty percent and to apply to any rate of duty "existing on January 1, 1945". Thus, a duty that had been previously cut fifty percent, as was the excise tax on imported crude oil and fuel oil under the Venezuelan trade pact in 1939, could be cut again by fifty percent. The reduced duty now is 10½ cents a barrel, and with an additional fifty percent could go to 5¼ cents—one-eight of a cent a gallon.

Sentiment on the Hill seems to crystallize for a one-year extension, instead of three, and that future reciprocal agreements be subject to at least some sort of review by Congress. One proposal advanced is to exempt petroleum excise taxes from application of the measure.

Congress to Act on Costs

INDUSTRY alarm at the Fifth Circuit Court of Appeals attack on Internal Revenue's regulation authorizing the expensing of intangible drilling and development costs has been somewhat allayed; first, by the introduction in the House by Ways and Means Committee Chairman Doughton of his resolution (Concurrent Resolution No. 50) to make clear the intent of Congress as to the "option" provision; secondly, by the Circuit Court's withdrawal of its original opinion and the writing of a new one that does not treat the subject as broadly as did the first.

Doughton's resolution would give Congressional blessing to the mooted option provision (officially known as section 29.23 (m)-16 of Treasury Regulations 111). In wording his resolution, the Ways and Means Chairman side-stepped opening up the question of tax legislation—nobody wants to bring up such a touchy subject at this time. It provides no new tax provision; merely states the intent of Congress in the matter of depletion allowance. And there is a pretty good chance Con. Res. 50 can be made to stick, with the powerful Ways and Means Committee, which writes revenue legislation, behind it.

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Oil Property Map of Colombia

Scale: 1 to 1,000,000
Showing in Color

1. Concessions in force of major operators
2. Private oil properties, with firm title
3. Concessions tested and surrendered
4. Location of all wildcats drilled in the country: depths, oilfields; pipelines and stations
5. Concession applications officially accepted

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Oil Companies Made Record Earnings in 1944

(*Continued from page 53*)

decline in demand for the major product—gasoline.

Practically all companies have been setting aside reserves for the transition from war to peace in the domestic field. Moreover, the companies with foreign investments in war-torn and enemy-occupied countries for several years have established reserves which they deem adequate for rehabilitation of their properties when they are returned to them.

Re-entrance into foreign fields by the American companies, however, is likely to be somewhat slower than expected. These companies will want to know (1) if political conditions are such as to warrent the investment of additional funds; (2) if the trend toward nationalization is to be increased and make it impossible to operate on a competitive basis, and (3) if the exchanges are to be free to permit the payment or dividends if more dollars are poured into foreign lands, or if blocked currencies are to continue.

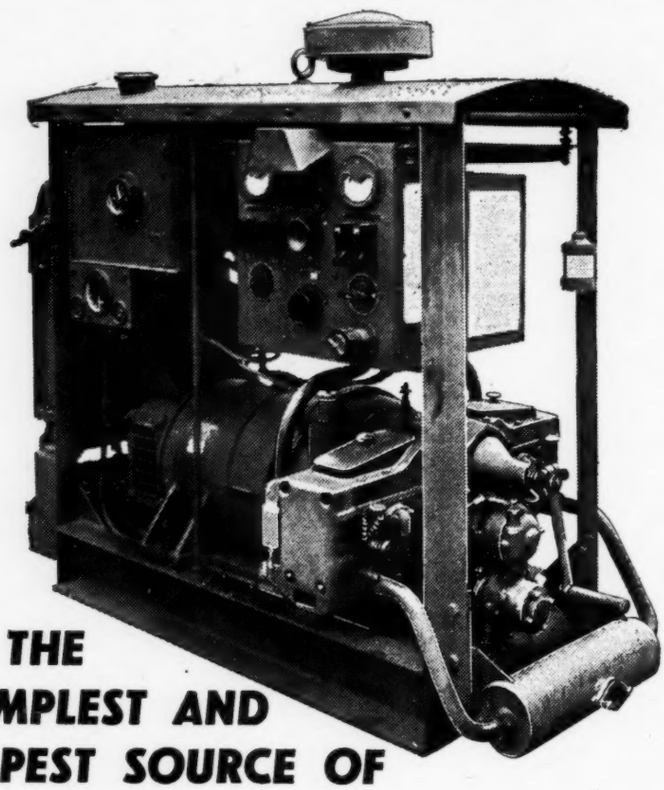
Reconversion of the American industry to a peace-time operating basis can be accomplished within a relatively short time—in most instances within a few days. The products it now manufactures, with a few exceptions, are those needed in a peacetime economy.

In foreign countries where the American companies have been able to continue their operations, definite strides have been made in the war years. The Texas Co. and Standard Oil Co. of California, through their jointly owned Arabian American Oil Co. in the Middle East, continue to expand production and refining facilities. In the Bahrein Island the refinery has been increased to about 60,000 barrels-a-day and a new refinery of 50,000 barrels-a-day capacity is under construction at Ras Tanura, in Arabia. The latter is expected to be completed by the end of this year.

Recently W. S. S. Rodgers, chairman of the Texas Co., told stockholders at the annual meeting that the proposed pipe line across Arabia to the eastern end of the Meriterranean probably will be constructed in a few years as it is considererd a "sound" project. This is the line which the U. S. Government originally planned to finance several years ago but it was abandoned because of the storm of opposition from the industry and others to the government's participation in it.

In Venezuela, the American companies operating there, such as Creole Petroleum Corp.; Socony-Vacuum Oil Co., Inc.; Gulf Oil Corp.; Atlantic Refining Co. and Sinclair Oil Corp., the latter through its affiliate Venezuelan Petroleum Corp., have undertaken exploratory and development operations on a scale commensurate with the availability of materials and manpower. The result has been that Venezuela's potential production today is somewhat in excess of 900,000 barrels a day against an actual production in pre-war years of nearer 550,000 barrels a day. Moreover, pipe line facilities in Venezuela have been expanded so that the country is in a position to ship a materially larger quantity of crude oil than before the war. An expansion of refining facilities in Venezuela is being planned in the post-war period, or earlier if materials are obtainable.

In the accompanying tabulation are shown net income, per share earnings on common stock, and other financial data for 23 leading American oil companies, as well as for Creole Petroleum Corp. and Imperial Oil Limited, the latter two operating in foreign countries.



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